

Original Article

Maternal influences on fruit and vegetable consumption of schoolchildren: case study in Hong Kong

Tony K.C. Yung, Albert Lee, Mandy M. Ho, Vera M.W. Keung and Jackie C.K. Lee

School of Public Health, Faculty of Medicine, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong

Abstract

This study investigated whether the consumption of fruit and vegetable by Chinese primary students in Hong Kong is associated with their mother's (1) nutrition knowledge on fruit and vegetables; (2) attitude towards healthy eating; and (3) fruit and vegetable consumption. Fourth- and fifth-grade students from 10 primary schools located in different districts, along with their mothers, were invited to each fill-in a questionnaire related to their diet intake. Accomplished questionnaires were matched and analysed. There were 1779 mother-child pairs who were successfully matched. Chi-square analysis revealed that students' fruit consumption is associated with their mother's (1) knowledge on fruit and vegetables ($P = 0.006$); (2) attitude towards healthy eating ($P = 0.010$); and (3) fruit consumption ($P < 0.001$). Students' vegetable consumption exhibited the same association with their mother's (1) knowledge ($P < 0.001$), (2) attitude towards healthy eating ($P = 0.005$), and (3) vegetable consumption ($P < 0.001$). Logistic regression showed that knowledge, attitude and dietary practice of mothers were independent factors associated with the consumption of fruit and vegetables by students and are not influenced by the level of education and household income. The results highlight the important role of parents in promoting fruit and vegetable consumption to primary students. It reaffirmed the importance of parent nutrition education in the formulation of a comprehensive health promotion strategy to school-aged children.

Keywords: child nutrition, dietary patterns, food intake, nutrition education, nutritional epidemiology, parent.

Correspondence: Tony K.C. Yung, School of Public Health, Faculty of Medicine, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong. E-mail: yungtony@cuhk.edu.hk

Introduction

Much has been written about the physiological benefits of fruits and vegetables in lowering the risk of developing long-term health problems such as obesity, cardiovascular diseases and certain types of cancers (Willett & Trichopoulos 1996; Joshipura *et al.* 1999; Chinn & Rona 2001; He *et al.* 2004; Ready & Katan 2004; Sato *et al.* 2005; Tercyak & Tyc 2006; Park *et al.* 2007). According to the World Health Organiza-

tion, the insufficient consumption of fruits and vegetables is one of the top five leading global burden risk factors (World Health Organization 2003). Despite this, the consumption of fruits and vegetables by Hong Kong schoolchildren remains relatively poor. A survey conducted in 1999 on 7192 children aged 10 to 16 years old indicated that less than 10% followed the daily recommendation of five servings of fruits and vegetables (Lee & Tsang 2004). The same study indicated that 8% of children had not consumed

any fruits and 3.2% of children had not consumed any vegetables in the week prior to the survey.

Improving the diet of children has been a consistent focus of public health nutrition. Inadequate consumption of fruits and vegetables is cited among the risk factors of myocardial infarction worldwide in both sexes and in all ages in all regions (Yusuf *et al.* 2004). Children are likely to maintain their dietary intake pattern from childhood into adolescence (Lytle *et al.* 2000; Lien *et al.* 2001; Wang *et al.* 2002). Moreover, many studies reveal that poor diet in childhood is associated with the likelihood of chronic diseases in adulthood (Moller *et al.* 1994; Klesges *et al.* 1995; Whincup *et al.* 2002), which account for 50% of the premature deaths worldwide (World Health Organization 2002).

In the past, the majority of nutrition promotion initiatives targeted only children, with minimal consideration of parental influence on children's diet behaviours. School-based health promotion activities were generally considered effective in improving dietary behaviours of schoolchildren. However, the sustainability and cost-effectiveness of most health promotion activities were inconclusive. The majority failed to identify consistent modifications to childhood dietary problems (Bennet & Hodgson 1992; Macdonald & Bunton 1992; Worsley 2005). Although initial improvement was observed in some of these, a systematic review of recent nutrition campaigns targeting 6- to 12-year-old children has shown that increases in fruit and vegetable consumption were usually minimal (Blanchette & Brug 2005).

In fact, the parental role on child's dietary habit has been discussed. In a study that examined the parental effect on children's snack consumption, Brown and Ogden (2004) demonstrated a significant correlation between parent and child for reported snack intake. Many other studies support the finding

that the dietary behaviours of parent and child are strongly associated (Klesges *et al.* 1991; Laessle *et al.* 2001; Fisher *et al.* 2002). Parents influence their child's dietary habits in several ways. They dictate the variety and quantity of foods available to their child. Their food-related behaviours also influence their child's eating habits and choice of foods. This strong parental modelling effect has been well reported (Harper & Sanders 1975; Blanchette & Brug 2005). Moreover, there are growing evidences that show that a parent's feeding style, i.e. the degree to which a parent tries to control the child's eating, is another important influence on the child's food choice (Birch *et al.* 2001).

Although the association between parent and child's eating habit has been documented, to our knowledge, there is no published research targeting the Chinese culture in which parent-child relationship and bonding may differ from Western culture (Rothbaum *et al.* 2000). As such, the current study attempted to answer the question whether Chinese schoolchildren in Hong Kong follow their mother's fruit and vegetable consumption patterns. The study also aimed to investigate if a mother's nutritional knowledge and attitude towards healthy eating are associated with their child's fruit and vegetable intake. We looked at these two parental factors because they are more readily modified, yet they contribute to the improvement of child's dietary health. It is hoped that the results of this study will provide evidence on parental influences and a better understanding of the role of parental knowledge and attitudes, and thus initiate more effective strategies in promoting dietary health of schoolchildren. Because mothers look after family diet in Chinese culture, throughout the study we targeted them to represent parent as their influence on child's diet is expected to be higher as compared with the fathers'.

Key messages

- In the Chinese society, mother has a key role in determining the fruit and vegetable consumption of schoolchildren.
- The maternal influence on fruit and vegetable consumption is not affected by their socioeconomic status.
- For successful implementation of healthy eating programmes for schoolchildren, the involvement of parents, especially mothers, is important.

Methods

Participants

Participants of this study were invited from 10 primary schools located in Hong Kong. In selecting schools to participate, reference was made on the resident's income level of the district where the school is located. The sampling aimed to represent subjects of different socioeconomic status and simulate the income pattern in Hong Kong. In each school, all fourth- and fifth-grade students (average age: between 9 and 11 years old) and their mothers were invited to participate in this study using a parents' notice attached to a written consent. The grade levels were chosen in consideration of better comprehension of the research questionnaire by the students. We excluded sixth-grade (the highest grade in Hong Kong primary schools) students as it would be difficult to follow up unclear data once the subjects graduate from their school.

Instruments

Separate questionnaires were designed for students and mothers. Both questionnaires were written in Chinese. The students' questionnaire mainly inquired about their average daily consumption of fruits and vegetables. Pictures showing portion sizes were printed to accompany the questions. It also covered questions asking students' attitude towards healthy eating as this may influence their dietary preference. The mothers' questionnaire consisted of items concerning their nutrition knowledge on fruits and vegetables (Box 1), their attitude towards healthy eating habits and their average daily fruit and vegetable consumption. It also covered demographic information such as educational level and household income. Questionnaires were pilot-tested prior to the com-

mencement of the study. The questionnaire content was also examined by experts in the field. The research committee of the Chinese University of Hong Kong approved both the content of the questionnaire and the study design.

Procedure

Data collection was carried out between June and July 2005. Students' questionnaires were administered by trained research staff during a classroom session. Prior written consent was sought from parents. All the questions were read out by the trained staff, and some concepts, such as portion size, were explained with photos and food models to increase the accuracy of the investigation. Parents' questionnaires were self-administered at home and returned to the school within a designated time frame. All the questionnaires were anonymous. Serial numbers were randomly assigned to each student and their corresponding parent for matching purposes.

All input data underwent a 'cleaning' process. Ambiguous and illogical answers were recorded as invalid. Questionnaires where more than half of the questions were unanswered or considered illogical were regarded as invalid. The verified students' and parents' data were then matched for data analysis. Unmatched questionnaires were excluded.

Data analysis

Data were analysed using the Statistical Package for the Social Sciences (Version 11.5, SPSS Inc, Chicago, IL, USA). This study adopted a knowledge score (KS) to represent mothers' knowledge about fruits and vegetables. The score, ranging from 0 to 7, was calculated by adding up each correct answer to the seven

<p>What is the recommended vegetable intake for children? What is the recommended vegetable intake for adults? What is the recommended fruit intake for children? What is the recommended fruit intake for adults? What is/are the nutrient(s) available in fruits and vegetables? What is/are the basic functions of fruits and vegetables toward health? What are the various food groups placed in the Healthy Eating Pyramid?</p>

Box 1. Questions concerning mothers' knowledge on fruits and vegetable as printed in the questionnaire.

questions printed in their questionnaire (Box 1). Throughout the study, adequate consumption of fruits was defined by having at least two servings in a day; while adequate vegetable consumption was defined by having at least three servings daily (Department of Health 2008).

Chi-square analysis was used to test for associations between children's fruit and vegetable consumption and various maternal determinants. To verify whether mothers' educational level and household income were not confounders of the previously discussed associations, logistic regression was performed on each identified maternal determinant by adjusting mothers' education and income.

Results

Demographic data

The response rate of parents was 77.6%. All the students completed and returned their questionnaire on the day of data collection. A total of 1779 mother-child pairs were successfully matched. Within these pairs, fourth-grade (50%) and fifth-grade (50%) students were evenly distributed. Male (48.8%) and female (51.2%) students accounted for a similar proportion. The majority of the mothers' ages ranged from 30–39 (49.2%) and 40–49 (43.6%). Most of the mothers (64.6%) have attained secondary school education, with 12% and 15.8% attaining tertiary and primary education, respectively. The household income of the participating families mostly fell within the '\$10 001–\$29 999' (43.6%) bracket, while '\$10 000 or below' and '\$30 000 or above' accounted for 36.7% and 15.6% of participants, respectively (Table 1). The educational level and household income distribution of mothers in this study were not markedly different from young females (30–49) in Hong Kong (Census and Statistics Department 2008).

Maternal determinants associated with children's fruit and vegetable consumption

There is an association between mothers' knowledge on fruits and vegetables and their child's consumption. Mothers were categorized into two groups

Table 1. Demographic characteristics of participating students and mothers

	Sex		Total
	Male	Female	
Students			
4th grade	433 (48.7%)	456 (51.3%)	889 (100%)
5th grade	436 (49.0%)	454 (51.0%)	890 (100%)
Total	869	910	1779
Mothers			
Age			
Below 20	48 (2.7%)		
20–29	18 (1.0%)		
30–39	876 (49.2%)		
40–49	775 (43.6%)		
50–59	26 (1.5%)		
60 or above	2 (0.1%)		
Not specified	34 (1.9%)		
Educational level			
Primary or below	281 (15.8%)		
Secondary	1150 (64.6%)		
Tertiary or above	213 (12.0%)		
Not specified	135 (7.6%)		
Monthly household income			
\$10 000 or below	652 (36.7%)		
\$10 001–\$29 999	776 (43.6%)		
\$30 000 above	278 (15.6%)		
Not specified	73 (4.1%)		

according to their knowledge on fruits and vegetables: passed (those with $KS \geq 4$) and failed (those with $KS < 4$). A significantly higher proportion of children (24.7% vs. 18.2%, $P = 0.006$) belonging to the passed mother group consumed an adequate amount of fruits. Children's vegetable consumption is also associated with their mother's knowledge. A significantly higher proportion of children (35.7% vs. 26.1%, $P < 0.001$) from the passed mother group consumed a sufficient amount of vegetables (Table 2).

The mothers' attitude towards the ease of sustaining healthy eating habits is associated with their child's consumption of fruits and vegetables. There was a significantly higher proportion of children consuming sufficient fruits (23.2% vs. 18%, $P = 0.01$) and vegetables (31.9% vs. 25.7%, $P = 0.005$) from the mother group who expressed that healthy eating is easy to sustain (Table 2).

The amount of fruits and vegetables consumed by mothers is found to be associated with their child's

Table 2. Percentage of students consuming adequate fruits and vegetables with different maternal determinants

	% of students with adequate consumption	
	Fruit	Vegetable
Mother group with passed knowledge score (KS)	24.7	35.7
Mother group with failed knowledge score (KS)	18.2	26.1
	(<i>n</i> = 1536, <i>P</i> = 0.006)	(<i>n</i> = 1538, <i>P</i> < 0.001)
Mother group expressed healthy eating is easy to sustain	23.2	31.9
Mother group expressed healthy eating is not easy to sustain	18.0	25.7
	(<i>n</i> = 1702, <i>P</i> = 0.010)	(<i>n</i> = 1704, <i>P</i> = 0.005)
Mother group with sufficient fruit intake	28.4	NA*
Mother group with insufficient fruit intake	16.8	NA*
	(<i>n</i> = 1713, <i>P</i> < 0.001)	
Mother group with sufficient vegetable intake	NA*	34.8
Mother group with insufficient vegetable intake	NA*	25.0
		(<i>n</i> = 1735, <i>P</i> < 0.001)

n reflected the actual number of mother–child pairs that have successfully completed the relevant domain of both students' and mothers' questionnaire. *Not available as no logical association could be made.

consumption. For the mother group consuming sufficient amounts of fruits, the proportion of their children having adequate fruits was significantly higher (28.4% vs. 16.8%, *P* < 0.001). A similar trend also applies to vegetable consumption. There was a significantly higher proportion (34.8% vs. 25%, *P* < 0.001) of children eating the recommended amount of vegetables in the mother group with adequate consumption (Table 2).

Possible confounding effect from mother's educational level and household income

The odds ratios for adequate consumption of fruits and vegetables by children were tabulated before and after adjusting for mother's educational level and household income (Table 3). It was found that for both fruit consumption and vegetable consumption, the identified associations were not affected by the mother's educational level and household income.

Discussion

The results of this study reveal that mothers play a crucial role in influencing the fruit and vegetable consumption of schoolchildren. A mother's consumption has been previously shown to be a strong determinant of a child's fruit and vegetable intake. Our results are

in line with the earlier research findings based on Western culture (Fisher *et al.* 2002; Cooke *et al.* 2004). A number of studies have provided possible explanations for this association. Amongst all of the studies, the parental modelling effect is thought to be a consistently predominant factor (Harper & Sanders 1975; Cullen *et al.* 2001; Blanchette & Brug 2005), wherein a child who observes a parent eating and enjoying fruits and vegetables increases the acceptance of such foods. Other factors, including parental feeding style, food preference and availability of foods were also reported. Growing evidence also points out that flavours in the mother's diet are transmitted from the amniotic fluid to the developing foetus (Mennella *et al.* 2001). This, together with the flavours inherent in breast milk, provides opportunities for the early exposure of certain foods and thus facilitates their acceptance during the weaning age. Nevertheless, a child's food preferences may inversely influence a family's food preferences. For this reason, an exact causal interpretation between the parent's and the child's food consumption is difficult to provide.

Our results indicate that if a mother has a better understanding of fruits and vegetables, as reflected by the KS, her child is more likely to eat a sufficient amount of fruits and vegetables. Given that in most cases, mothers play the determining role in the family's diet, their recognition of the health benefits

Table 3. Odds ratios for adequate consumption of fruit and vegetable by students before and after adjusting mothers' educational and household income

Factor	Condition	Before adjusting mother's education and income			After adjusting mother's education and income		
		OR	95% CI for OR		OR	95% CI for OR	
Fruit							
Mother's knowledge on fruit and vegetables	Passed knowledge score	1.967	1.536	2.518	1.402	1.057	1.860
	Failed knowledge score	1.000			1.000		
Mother's attitude towards healthy eating	Easy to sustain	1.372	1.082	1.736	1.473	1.143	1.898
	Not easy to sustain	1.000			1.000		
Mother's fruit consumption	Sufficient	1.467	1.124	1.915	2.027	1.555	2.644
	Insufficient	1.000			1.000		
Vegetables							
Mother's knowledge on fruit and vegetables	Passed knowledge score	1.573	1.239	1.997	1.445	1.121	1.863
	Failed knowledge score	1.000			1.000		
Mother's attitude towards healthy eating	Easy to sustain	1.357	1.099	1.675	1.459	1.165	1.828
	Not easy to sustain	1.000			1.000		
Mother's vegetable consumption	Sufficient	1.596	1.289	1.976	1.686	1.342	2.119
	Insufficient	1.000			1.000		

CI, confidence interval; OR, odds ratio.

of fruits and vegetables therefore improves the availability and accessibility of these foods at home. As such, the consumption by their child is expected to be higher. Gibson *et al.* (1998) found similar results, reporting that a mother's nutritional knowledge was an independent predictor of a child's fruit consumption. Although there were differences in the design between the two studies, both revealed that a better understanding of fruits and vegetables by the mother favours the consumption of these foods by her child.

Furthermore, our results reveal that when a mother has a positive attitude towards the ease of maintaining healthy eating, their child's fruit and vegetable consumption is more likely to be adequate. This is another important piece of information to explain how the parental modelling effect influences a child's diet. Parental attitudes towards healthy eating influence a child via daily activities and conversations, which in turn affects their food choice and quantity.

Higher socioeconomic status, as reflected by income and educational level, is associated with fruit and vegetable consumption in adults and youths (Milligan *et al.* 1998; Billson *et al.* 1999; Wardle *et al.* 2003). There are studies which also showed that parental education level and household income are determining factors in

a child's dietary behaviour (Crawford *et al.* 1995; McLeod *et al.* 2003; Rogers *et al.* 2003; Emerson *et al.* 2006). To control the effect brought by these two factors, the current study adopted logistic regression to analyse each identified mother-child association by adjusting maternal education level and household income. It was found that all identified associations were independent of the influence from maternal education level and household income.

At least two implications are provided by the current study. First, it demonstrates that maternal knowledge, attitude and self-consumption are positively associated with the child's fruit and vegetable consumption. More importantly, the study reveals that these associations are independent of the mother's education level and household income. The results provide valuable information to health advocates, and shows that educating parents as a means to promote healthy eating in children is a critical component in any school-based or territory-wide campaigns. It should not only enhance parents' knowledge acquisition, but also their attitudes towards healthy eating, subsequently improving their own fruit and vegetable consumption. Second, this study provides evidence for the cultural consideration

of maternal influence. While it is beyond the scope of this study to examine this concept in detail, it has been demonstrated in the mother–child association existing within Chinese culture.

One of the study's limitations is the non-random selection of schools; although the institutions were invited according to their geographical location representing different socioeconomic levels. However, according to the census statistics, the demographic characteristics of participating mothers are not markedly different from the Hong Kong population. Therefore, the results could apply to the general population. We targeted mothers as our subjects because in the Chinese culture, mothers look after the family diet. Therefore, their influence on their child is expected to be higher as compared with the fathers'. Another limitation is that every possible confounding factor affecting the identified associations was not examined here. Only parental education and household income were analysed for their strong influence on children's fruit and vegetable consumption. Blanchette and Brug (2005) conducted a systematic review on the determinants of fruit and vegetable consumption among children, and developed a comprehensive list of evidence-based determinants. However, they did not investigate the interrelations between such determinants. For instance, one might be interested to know how the effect of junk foods commercials antagonizes the parental control over children's fruits and vegetables consumption. As such, further studies in this regard are warranted.

Conclusions

This study demonstrated the maternal influences that shape the eating behaviours of schoolchildren. For the successful implementation of healthy eating programmes for children, the involvement of parents, especially mothers, is important. Parental education programmes should aim to improve the overall health literacy of mothers and equip them to become role models for their children. This can be achieved by the active involvement of parents in developing health policies in the school and the organization of school nutrition promotion activities.

Acknowledgement

The authors would like to thank Kwok Keung Wong, who provided invaluable technical support to the analysis in the study, and to all colleagues for their contribution to the entire survey. The author also thanks Anthea Lee for her comments during the development of the paper.

Source of funding

The study was partly supported by the Healthcare and Promotion Fund of the Hong Kong Government.

Conflicts of interest

No conflicts of interest have been declared.

References

- Bennet P. & Hodgson R. (1992) Psychology and health promotion. In: *Health Promotion: Disciplines and Diversity* (eds R. Bunton & G. Macdonald), pp. 23–41. Routledge: London.
- Billson H., Pryer J.A. & Nichols R. (1999) Variation in fruit and vegetable consumption among adults in Britain. An analysis from the dietary and nutritional survey of British adults. *European Journal of Clinical Nutrition* **53**, 946–952.
- Birch L., Fisher J., Grimm-Thomas K., Markey C., Sawyer R. & Johnson S. (2001) Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite* **36**, 201–210.
- Blanchette L. & Brug J. (2005) Determinants of fruit and vegetable consumption among 6–12-year-old children and effective interventions to increase consumption. *Journal of Human Nutrition & Dietetics* **18**, 431–443.
- Brown R. & Ogden J. (2004) Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. *Health Education Research* **19**, 261–271.
- Census and Statistics Department (2008) *Hong Kong 2006 population by-census – main tables*. Available at: http://www.censtatd.gov.hk/products_and_services/products/publications/statistical_report/population_and_vital_events/index_cd_B1120051_dt_latest.jsp (accessed 12 August 2008).
- Chinn S. & Rona R.J. (2001) Prevalence and trends in overweight and obesity in three cross sectional studies of British children, 1974–94. *British Medical Journal* **322**, 24–26.

- Cooke L.J., Wardle J., Gibson E.L., Sapochnik M., Sheiham A. & Lawson M. (2004) Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition* **7**, 295–302.
- Crawford P.B., Obarzanek E., Schreiber G.B., Barrier P., Goldman S., Frederick M.M. *et al.* (1995) The effects of race, household income, and parental education on nutrient intakes of 9- and 10-year-old girls. NHLBI Growth and Health Study. *Annals of Epidemiology* **5**, 360–368.
- Cullen K.W., Baranowski T., Rittenberry L., Cosart C., Hebert D. & de Moor C. (2001) Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures. *Health Education Research* **16**, 187–200.
- Department of Health (2008) *Enjoy fruits and vegetables everyday two plus three is the way*. Available at: http://2plus3.chcu.gov.hk/html/eng/sec3_index.asp?fname=sec3_index.aspx (accessed 12 August 2008).
- Emerson E., Graham H. & Hatton C. (2006) Household income and health status in children and adolescents in Britain. *European Journal of Public Health* **16**, 354–360.
- Fisher J.O., Mitchell D.C., Smiciklas-Wright H. & Birch L.L. (2002) Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *Journal of the American Dietetic Association* **102**, 58–64.
- Gibson E.L., Wardle J. & Watts C.J. (1998) Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite* **31**, 205–228.
- Harper L. & Sanders K. (1975) The effect of adults' eating on young children's acceptance of unfamiliar foods. *Journal of Experimental Child Psychology* **20**, 206–214.
- He K., Hu F.B., Colditz G.A., Manson J.E., Willett W.C. & Liu S. (2004) Changes in intake of fruits and vegetables in relation to risk of obesity and weight gain among middle-aged women. *International Journal of Obesity & Related Metabolic Disorders* **28**, 1569–1574.
- Joshi K.J., Ascherio A., Manson J.E., Stampfer M.J., Rimm E.B., Speizer F.E. *et al.* (1999) Fruit and vegetable intake in relation to risk of ischemic stroke. *Journal of the American Medical Association* **282**, 1233–1239.
- Klesges R.C., Klesges L.M., Eck L.H. & Shelton M.L. (1995) A longitudinal analysis of accelerated weight gain in preschool children. *Pediatrics* **95**, 126–130.
- Klesges R.C., Stein R.J., Eck L.H., Isbell T.R. & Klesges L.M. (1991) Parental influence on food selection in young children and its relationships to childhood obesity. *American Journal of Clinical Nutrition* **53**, 859–864.
- Laessle R.G., Uhl H. & Lindel B. (2001) Parental influences on eating behavior in obese and nonobese preadolescents. *International Journal of Eating Disorders* **30**, 447–453.
- Lee A. & Tsang C.K. (2004) Youth risk behavior in a Chinese population: a territory-wide youth risk behavioral surveillance in Hong Kong. *Public Health* **118**, 88–95.
- Lien N., Lytle L.A. & Klepp K.I. (2001) Stability in consumption of fruit, vegetables, and sugary foods in a cohort from age 14 to age 21. *Preventive Medicine* **33**, 217–226.
- Lytle L.A., Seifert S., Greenstein J. & McGovern P. (2000) How do children's eating patterns and food choices change over time? Results from a cohort study. *American Journal of Health Promotion* **14**, 222–228.
- Macdonald G. & Bunton R. (1992) Health promotion: discipline or disciplines? In: *Health Promotion: Disciplines and Diversity* (eds R. Bunton & G. Macdonald), pp. 6–22. Routledge: London.
- McLeod C.B., Lavis J.N., Mustard C.A. & Stoddart G.L. (2003) Income inequality, household income, and health status in Canada: a prospective cohort study. *American Journal of Public Health* **93**, 1287–1293.
- Mennella J., Jagnow C. & Beauchamp G. (2001) Prenatal and postnatal flavor learning by human infants. *Pediatrics* **107**, E88.
- Milligan R.A., Burke V., Beilin L.J., Dunbar D.L., Spencer M.J., Balde E. *et al.* (1998) Influence of gender and socio-economic status on dietary patterns and nutrient intakes in 18-year-old Australians. *Australian & New Zealand Journal of Public Health* **22**, 485–493.
- Moller J.H., Taubert K.A., Allen H.D., Clark E.B. & Lauer R.M. (1994) Cardiovascular health and disease in children: current status. A special writing group from the Task Force on Children and Youth, American Heart Association. *Circulation* **89**, 923–930.
- Park Y., Subar A.F., Kipnis V., Thompson F.E., Mouw T., Hollenbeck A. *et al.* (2007) Fruit and vegetable intakes and risk of colorectal cancer in the NIH-AARP Diet and Health Study. *American Journal of Epidemiology* **166**, 170–180.
- Ready K.S. & Katan M.B. (2004) Diet, nutrition and the prevention of hypertension and cardiovascular disease. *Public Health Nutrition* **7**, 167–186.
- Rogers I., Emmett P. & Team A.S. (2003) The effect of maternal smoking status, educational level and age on food and nutrient intakes in preschool children: results from the Avon Longitudinal Study of Parents and Children. *European Journal of Clinical Nutrition* **57**, 854–864.
- Rothbaum F., Morelli G., Pott M. & Liu-Constant Y. (2000) Immigrant-Chinese and Euro-American parents' physical closeness with young children: themes of family relatedness. *Journal of Family Psychology* **14**, 334–348.
- Sato Y., Tsubono Y., Nakaya N., Ogawa K., Kurashima K., Kuriyama S. *et al.* (2005) Fruit and vegetable consumption and risk of colorectal cancer in Japan: the Miyagi Cohort Study. *Public Health Nutrition* **8**, 309–314.

- Tercyak K.P. & Tyc V.L. (2006) Opportunities and challenges in the prevention and control of cancer and other chronic diseases: children's diet and nutrition and weight and physical activity. *Journal of Pediatric Psychology* **31**, 750–763.
- Wang Y., Bentley M.E., Zhai F. & Popkin B.M. (2002) Tracking of dietary intake patterns of Chinese from childhood to adolescence over a six-year follow-up period. *Journal of Nutrition* **132**, 430–438.
- Wardle J., Jarvis M.J., Steggle N., Sutton S., Williamson S., Farrimond H. *et al.* (2003) Socioeconomic disparities in cancer-risk behaviors in adolescence: baseline results from the Health and Behaviour in Teenagers Study (HABITS). *Preventive Medicine* **36**, 721–730.
- Whincup P.H., Gilg J.A., Papacosta O., Seymour C., Miller G.J., Alberti K.G. *et al.* (2002) Early evidence of ethnic differences in cardiovascular risk: cross sectional comparison of British South Asian and white children. *British Medical Journal* **324**, 635.
- Willett W.C. & Trichopoulos D. (1996) Nutrition and cancer: a summary of the evidence. *Cancer Causes & Control* **7**, 178–180.
- World Health Organization (2002) *The World Health Report 2002 – Reducing Risks, Promoting Healthy Life*. WHO: Geneva.
- World Health Organization (2003) *WHO Fruits and Vegetables Promotion Initiative – Report of the Meeting*. WHO: Geneva.
- Worsley A. (2005) Children's healthful eating: from research to practice. *Food & Nutrition Bulletin* **26**, S135–S143.
- Yusuf S., Hawken S., Ounpuu S., Dans T., Avezum A., Lanas F. *et al.* (2004) Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART Study): case-control study. *Lancet* **364**, 937–952.