

Original Article

Diet and health trends in Taiwan: comparison of two nutrition and health surveys from 1993-1996 and 2005-2008

Wen-Harn Pan PhD^{1,2,3}, Hsing-Juan Wu MS⁴, Chih-Jung Yeh PhD⁵,
Shao-Yuan Chuang PhD¹, Hsing-Yi Chang PhD¹, Nai-Hua Yeh MS^{1,2},
Yao-Te Hsieh MS²

¹Nutrition Medicine Research Program, Division of Preventive Medicine and Health Sciences Research, Institute of Population Health Sciences, National Health Research Institute, Miaoli, Taiwan

²Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan

³Department of Biochemical Science and Technology, National Taiwan University, Taipei, Taiwan

⁴Department of Food and Nutrition, Chung Hwa University of Medical Technology, Tainan, Taiwan

⁵Department of Public Health, Chung-Shan Medical University, Taichung, Taiwan

The availability of new food choices has increased dramatically in recent times, whilst increasingly sedentary lifestyles have reduced calorie intake requirements. The present study uses 24 hour dietary recall data, and biochemical and anthropometric measurements from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan (NAHSIT) to investigate trends in dietary habits, and cardiovascular and metabolic disease markers in Taiwanese persons aged 19 years and above. We found that dietary habits in Taiwan are changing, particularly in regards to intakes of cakes and sweets, and sugary drinks. Energy intakes in young people have increased, and combined with an increasingly sedentary lifestyle, this may have led to the increase in obesity and associated metabolic diseases. Large increases in the prevalence of the metabolic syndrome, diabetes, hypertriglyceridemia and gout have been observed. Fortunately, some positive dietary and behavioral changes have also been observed; including an increased avoidance of products made from animal fats and oils⁷ and a concomitant increase in the use of vegetable oil. Intakes of fruit and vegetables, soy products, fish, whole grains, nuts and seeds have also increased; and intakes of red meat, carbohydrates and sodium containing foods have decreased. These positive dietary changes could explain the lack of large changes in the prevalence of hypertension and hypercholesterolemia, and the decrease in prevalence of hyperuricemia. Intake of dairy products remains low, and continues to be an important dietary issue in Taiwan.

Key Words: metabolic syndrome, anemia, health indices, 24-hour recall, food frequency

INTRODUCTION

The world's population is currently facing unprecedented changes to diet and lifestyle. In the United States, the prevalence of overweight and obesity has rapidly increased and now affects over three fourths of the population.¹ The susceptibility of Asian peoples to diabetes has also emerged,² and in recent years the prevalence of diabetes in Asia has rapidly increased within a very short period of time. Diabetes is now occurring at younger ages and in people without a relatively high body mass index.³

Similarly in Taiwan, improvements in transport and the increased availability of imported foods has led to Taiwanese people being overwhelmed with new food products in recent years. The food market has undergone enormous change with the promotion of many new food varieties. The impact of these changes on the food choices and dietary intakes of Taiwanese people needs careful monitoring. Moreover, in addition to changes in the food market, increasing technological development has meant that more and more jobs require employees to

sit for long hours, whilst the amount of leisure time and physical activity of the Taiwanese population in general remains low.⁴ A sedentary lifestyle decreases the amount of energy required in the diet, and how to eat less (energy not exceed requirements) and eat well (sufficient amounts of essential nutrients and dietary ingredients) has become a new challenge in Taiwan. The health impact and trends in disease markers as a result of these dietary changes are to date unknown. The Bureau of Food Sanitation, Department of Health regularly commissions nutrition and

Corresponding Author: Dr Wen-Harn Pan, Nutrition Medicine Research Program, Division of Health Sciences Research and Preventive Medicine, Institute of Population Health Sciences, National Health Research Institute, 35 Keyan Road, Zhunan, Miaoli County 350, Taiwan.

Tel: 886-2-278999121; Fax: 886-2-27823047

Email: pan@ibms.sinica.edu.tw

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health surveys to obtain information on such trends and enable timely policy development aimed at promoting better health and nutrition.

The most recently completed Nutrition and Health Survey in Taiwan was carried out from 2005 to 2008. Data was collected by household interviews from all children aged 6 years and below, and adults aged 19 years and above who were residents in the sampled households. Data was collected on diet, health indicators, and related variables. Lifestyle change, obesity and related metabolic diseases are important global problems in the 21st century. However, despite the highly prevalence over-nutrition, it appears that nutritional deficiencies still exist. As a result, we investigated diseases related to overnutrition such as obesity, the metabolic syndrome and risk factors for cardiovascular disease, as well as important conditions of nutritional deficiency such as anemia. We investigated dietary and health indices associated with the above health problems in adults aged 19 years and over and investigated trends by comparing recent data with that from the 1993-1996 Nutrition and Health Survey in Taiwan.

MATERIALS AND METHODS

The 2005-2008 Nutrition and Health Survey in Taiwan (NAHSIT) was carried out using stratified multi-stage sampling. The survey was conducted on adult members of selected households aged 19 years and above, and on children and infants aged 6 years and below. The present study only analyzes data on adults. The design and contents of the NAHSIT have been described in detail previously by Tu et al.⁶

This study analyzes anthropometric data and biochemistry from 8 hour fasting blood samples collected as part of the health exam component of NAHSIT. Based on definitions used by the Department of Health in Taiwan,⁷ overweight was defined as a body mass index (BMI) ≥ 24 kg/m² and < 27 kg/m², and obesity was defined as a BMI of ≥ 27 kg/m². Central obesity was defined as a waist circumference of ≥ 90 cm in men and ≥ 80 cm in women.⁷ Waist circumference measurements were taken at the

midpoint between the lower edge of the rib cage and the top of the iliac crest. Hypertension was defined according to JNC VII criteria.⁸ Diabetes was defined as a fasting blood sugar of ≥ 126 mg/dL or the use of blood sugar lowering medications.⁹ Hypercholesterolemia was defined as a cholesterol level ≥ 240 mg/dL and hypertriglyceridemia was defined as a triglyceride level ≥ 200 mg/dL.¹⁰ The cut-off point for hyperuricemia was ≥ 7.7 mg/dL in men and ≥ 6.6 mg/dL in women.¹¹ Self-reported use of medications to control the above disorders was also considered in the definition. A hemoglobin of < 13 mg/dL in men and < 12 mg/dL in women indicated anemia.¹² The presence of gout was based on self-reported physician diagnosed gout. Data on calorie intake; the proportion of calorie intake from the three macronutrients; intakes of carbohydrates, protein, fats and oils, dairy products, fruit and vegetables, and sweetened foods; sources of sodium in the diet; and use of animal or vegetable oil during cooking were obtained from 24 hour dietary recall. The methods for data collection have been described in detail in previous reports.^{13,14} In addition, this study uses data from a questionnaire of eating habits investigating intake of fats and oils. Questions included: "When you eat poultry, do you eat the fat and skin?" and "When you eat meat, do you eat the fat and skin?" Responses of choice were "always", "most of the time", "half of the time", "sometimes", and "never". In addition, respondents were asked if they ate fried foods and were asked to select from the same five responses.

As the aim of this study was to describe trends, weighted analyses were carried out with SUDAAN to adjust for design effects in an attempt to estimate and compare the mean values of parameters and the prevalence rates of disease markers between the two surveys.

RESULTS

Sociodemographic characteristics of survey participants

Table 1 shows the age, gender, education level, and ethnicity distributions of the samples from of NAHSIT 1993-1996 and 2005-2008. There are significant differ-

Table 1. Characteristics of participants by survey: NAHSIT 1993-1996 and 2005-2008

	NAHSIT 1993-1996 (%)	NAHSIT 2005-2008 (%)	p value
Sex			
female	48.7	51.2	0.08
Age, yrs			
19-30	30.6	24.6	
31-44	34.6	30.4	
45-64	23.7	30.5	<0.001*
65+	11.1	14.5	
Education			
Primary school and below	41.0	23.5	
Junior high school	18.5	14.0	
Senior high school	25.6	45.9	<0.001*
University	14.9	16.6	
Ethnicity			
Fukienese	80.2	77.1	
Hakka	10.7	13.1	
Mainland Chinese	7.4	8.8	0.688
Indigenous	1.7	1.0	

ence between two periods in terms of age, and education. However, we did not adjust these two factors in order to reflect the true situation.

Eating habits and dietary trends

Intake of fats and oils and related eating habits

People in Taiwan traditionally eat the fat and skin of poultry and meat when they eat these foods (Figure 1). The proportion of people who reported eating fat and skin with poultry “all” or “most of the time” has significantly decreased from 50% in 1993-1996 to 40% in the current survey. The proportion of people who reported eating fat and skin with meat “all” or “most of the time” has also decreased from around 40% to less than 40% (with borderlines significances). The proportion of those reporting eating meat or poultry fried in oil “all” or “most of the time” decreased from about 30% in the previous survey to less than 10% in the current survey. All changes with regard to fish and soy products demonstrated in figures 2 to 3 are statistically significant. The proportion of those who reported eating fish fried in oil all or most of the time decreased from about 70% in the previous survey to

50% in the current survey (Figure 2). The proportion of those who reported eating soy products fried in oil “all” or “most of the time” also decreased from 20% in the previous survey to 10% in the current survey. The proportion of those who reported eating fried vegetables “all” or “most of the time” decreased from about 80% in the previous survey to 70% in the current survey (Figure 3). Therefore, it is clear that people have decreased their oil and fat intake associated with these foods.

Cooking oil (Figure 4)

The majority of Taiwanese have used vegetable oil in their cooking in the past several decades. Although the proportion of those using animal fat in cooking has never been high, 24 hour dietary recall data from the 2005-2008 survey showed a clear further decrease in the use of animal fat by the 19-64 year olds. In addition, the intake of nuts and seeds in this age group showed a slight increase. As shown in Figure 5, in the previous survey the most common type of animal fat used was lard and mixed lard/vegetable oil. In the current survey, there is almost no use of lard/vegetable oil. With regards to vegetable oil,

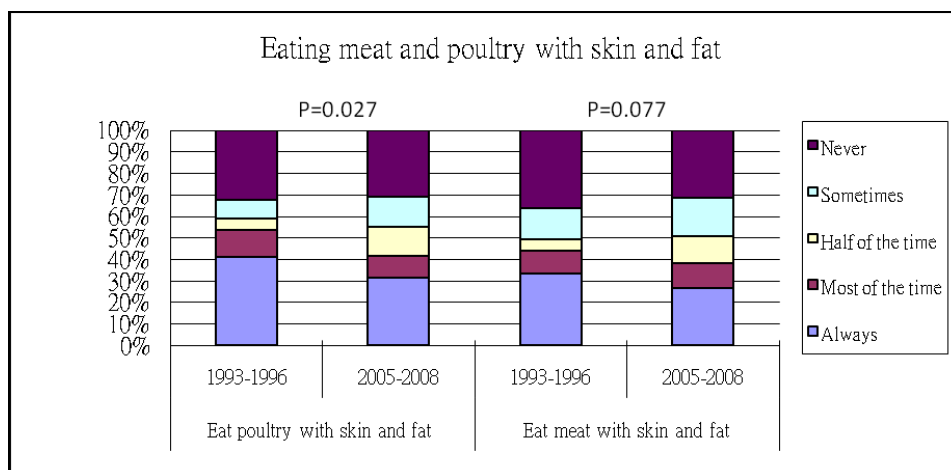


Figure 1. Trends in eating meat and poultry with skin and fat in Taiwanese adults (19 years and above). Comparison of the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

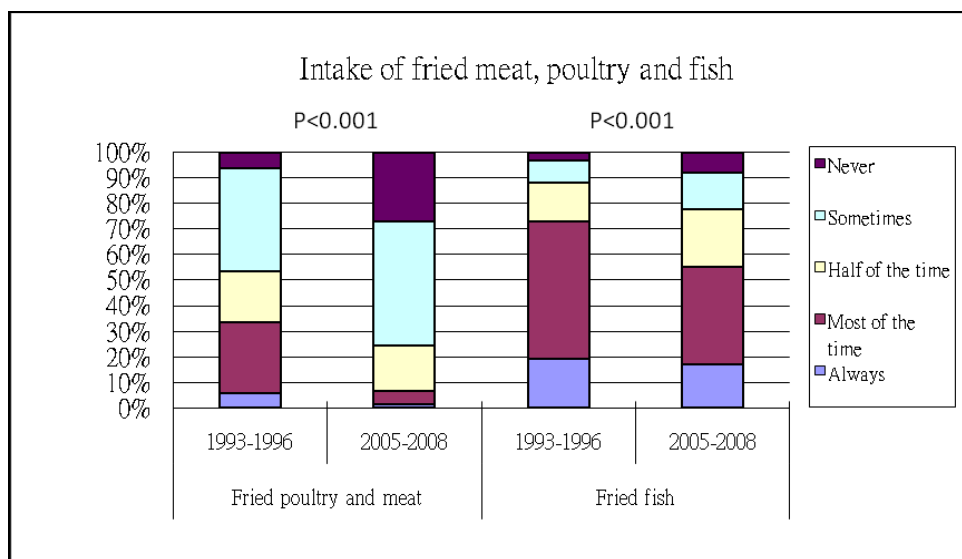


Figure 2. Trends in eating fried meat, poultry and fish in Taiwanese adults (19 years and above). Comparison of the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

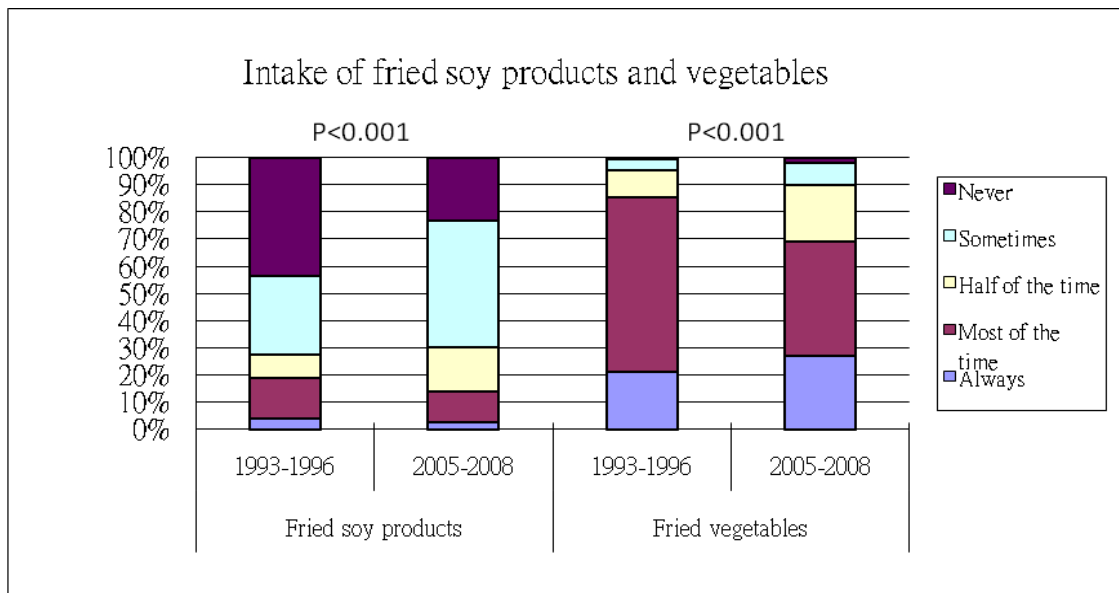


Figure 3. Trends in eating fried soy products and vegetables in Taiwanese adults (19 years and above). Comparison of the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

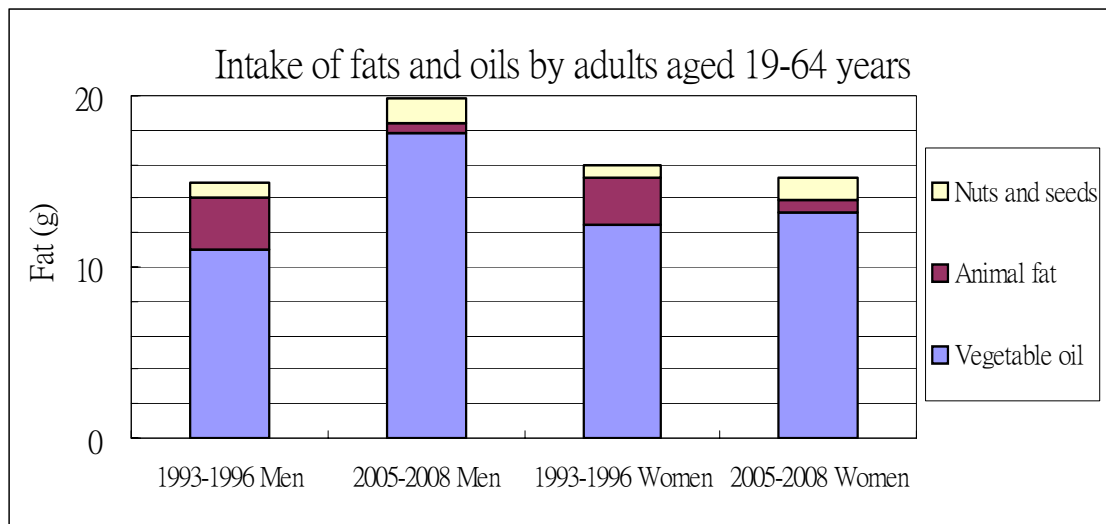


Figure 4. Trends in intake of fats and oils (including vegetable oil and animal fat used in cooking, and nuts and seeds) in Taiwanese adults aged 19-64 years. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

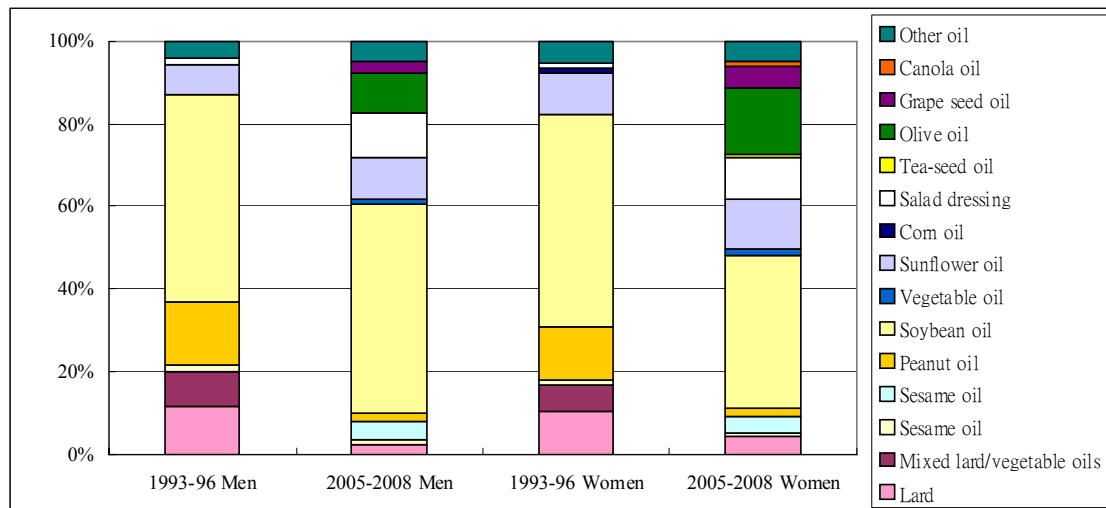


Figure 5. Types of cooking oils used by Taiwanese adults (19 years and above). Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

soybean oil was the most commonly used oil in both the 1993-1996 and 2005-2008 survey. However, in recent years there has been an increase in the varieties of vegetable oils used in cooking with a substantial number of people using products such as olive oil, sunflower oil, salad dressing, grape seed oil, and sesame oil.

Carbohydrates (Figure 6)

Refined rice and rice products has remained the staple food in Taiwan. However, the proportion of carbohydrate intake from rice has fallen in recent years and that from wheat has increased. In addition, not only has there been a large increase in intake of whole grains, roots and dried beans, but intakes of processed wheat products such as cakes and biscuits, instant noodles and bread have also all increased.

Dairy products (Figure 7)

Full cream milk is the most common dairy product consumed by 19-64 year olds. Consumption of low-fat milk is not common and there is very little consumption of ice cream. Intake of dairy products has decreased rather than

increased since last survey. Those aged 19-64 years have a mean intake of 0.4 cups.

Protein rich foods (Figure 8)

Mean intakes of red meats such as pork and beef decreased significantly by about one third. However, intakes of poultry, seafood and soy products increased (all ps <0.05). Intake of eggs remained stable in women, but increased significantly in men.

Fruit and vegetables (Figure 9)

Intakes of all types of vegetables, particularly light green vegetables, and mushrooms significantly increased, but intake of seaweed decreased. In addition, intake of fruit increased by more than 30%.

Foods high in sodium (Figure 10)

Sodium intake increased slightly in men aged 19-64 years and decreased slightly in women, but no statistical significance was found. About half of sodium consumed came from table salt and just under the remaining half of intake came from soy sauce and other condiments.

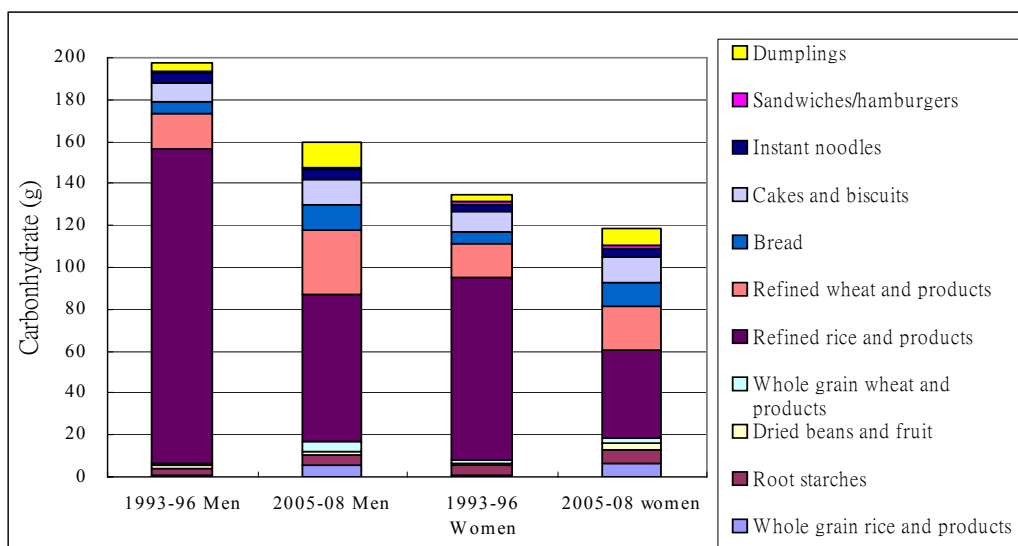


Figure 6. Trends in intake of carbohydrates by Taiwanese adults aged 19-64 years Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

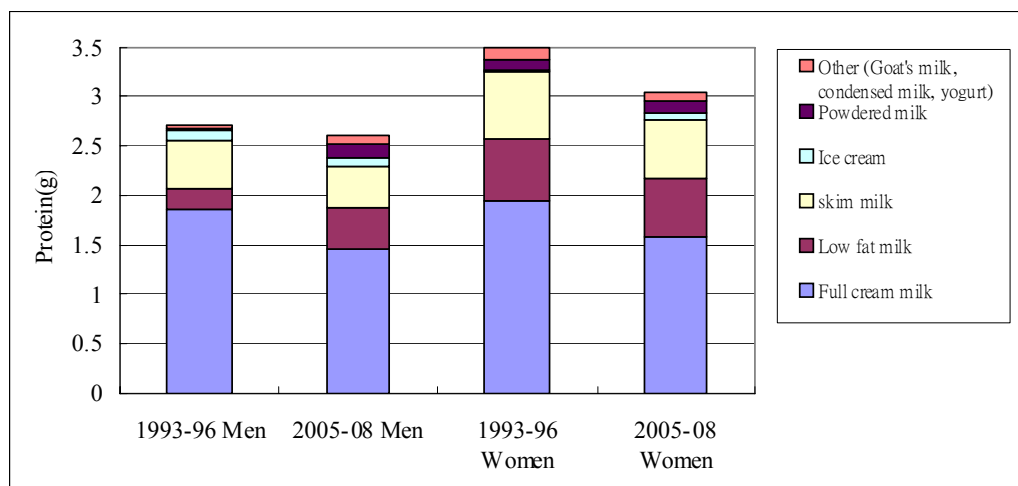


Figure 7. Trends in intake of dairy products by adults aged 19-64 years. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

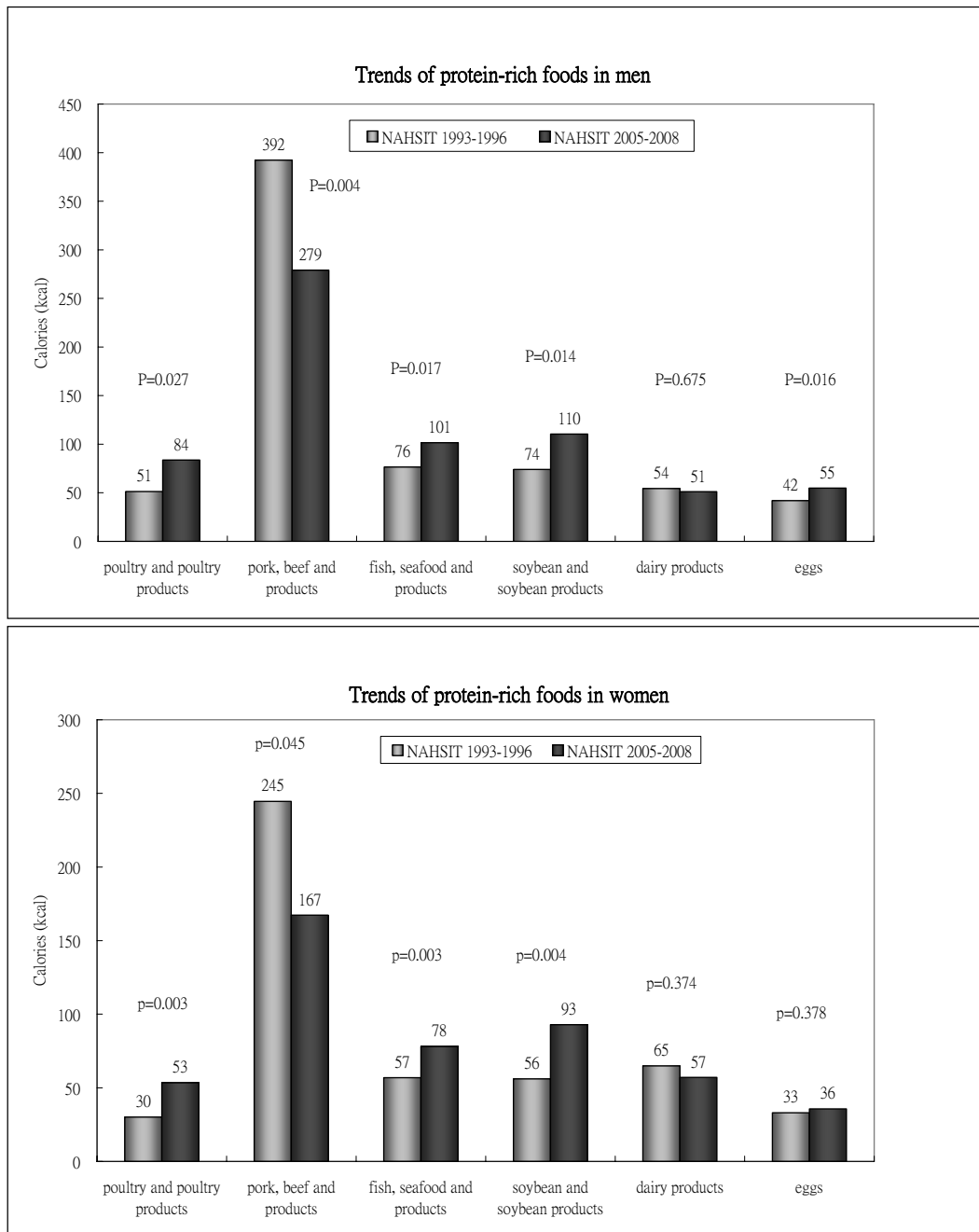


Figure 8. Trends in intake of protein rich foods (shown in energy) by adults aged 19-64. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan.

Sweetened foods (Figure 11)

Adults aged 19-64 years eat more sugar-sweetened foods than older people. Regardless of gender or age group, calorie intake from sugar-sweetened foods in the 2005-2008 survey increased significantly by 100% from the previous survey. The most commonly consumed sweetened food was sugary drinks (including ices and processed juice).

Energy¹⁸

Energy intake in older people decreased slightly from the 1999-2000 survey to the 2005-2008 survey (1829 kcal → 1709 kcal in men; 1471 kcal → 1314 kcal in women). However, calorie intakes in women aged 19-30 years (1492 kcal → 1878 kcal) and in men aged 31-64 years

(2125 kcal → 2377 kcal) showed a substantial increase. There was no great change in calorie intake in young men or middle aged women.

Distribution of intakes of the three macronutrients (Figure 12)

An important trend observed in the current study was an increase in the proportion of mean calorie intake from protein from 15.5% to 17%. In the 2005-2008 survey, 51-53% of calorie intake in 19-64 year olds came from carbohydrates, 31-32% came from fat, and 17% came from protein. In older people these figures were 55-57%, 26-28% and 17%, respectively. In other words, the distribution of calorie intake from the three macronutrients was more ideal in older people.

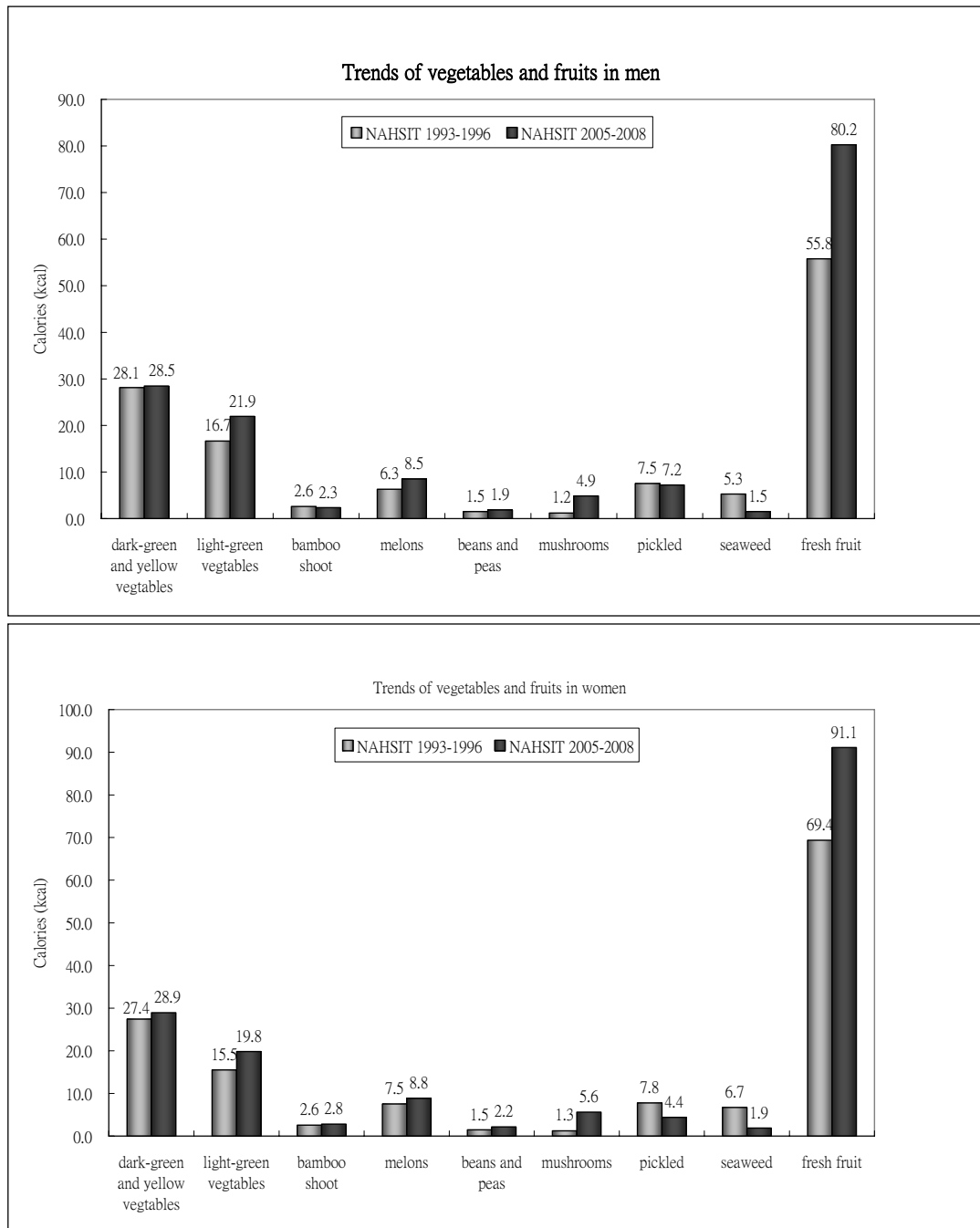


Figure 9. Trends in intake of fruit and vegetables by adults (aged 19-64) . Comparison of 24 dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

Trends in important health indices and disease markers (Table 2)

Overweight and obesity

The prevalence of overweight and obesity in adult males (19 years and above) in Taiwan increased from 33.4% in 1993-1996 to 51% in the current survey. In other words, about half of the adult male population are now either overweight (32%) or obese (19%). In adult women, the prevalence of overweight and obesity increased slightly from 33.5% to 35.9%.

Mean waist circumference, central obesity, the metabolic syndrome and diabetes

Mean waist circumference increased by 5.1 cm in men and 4 cm in women compared to the 1993-1996 survey. The prevalence of central obesity increased by 13.9% in

men and 13.4% in women. Currently one in four adult men and one in three adult women have central obesity. The prevalence of the metabolic syndrome increased from 10.1% to 18.9% in men and from 26.4% to 31.5% in women between the two surveys.¹⁵ There was also a large increase in the prevalence of diabetes from 3.2% in 1993-1996 to 12.0% in the current survey in men and from 5.5% to 8% in women.

Hyperlipidemia

Currently 13.4% of men and 10% of women have high cholesterol. However, the increase in prevalence of hypercholesterolemia was not significant between surveys. However, the prevalence of high triglycerides showed a significant increase in men between surveys. The preva-

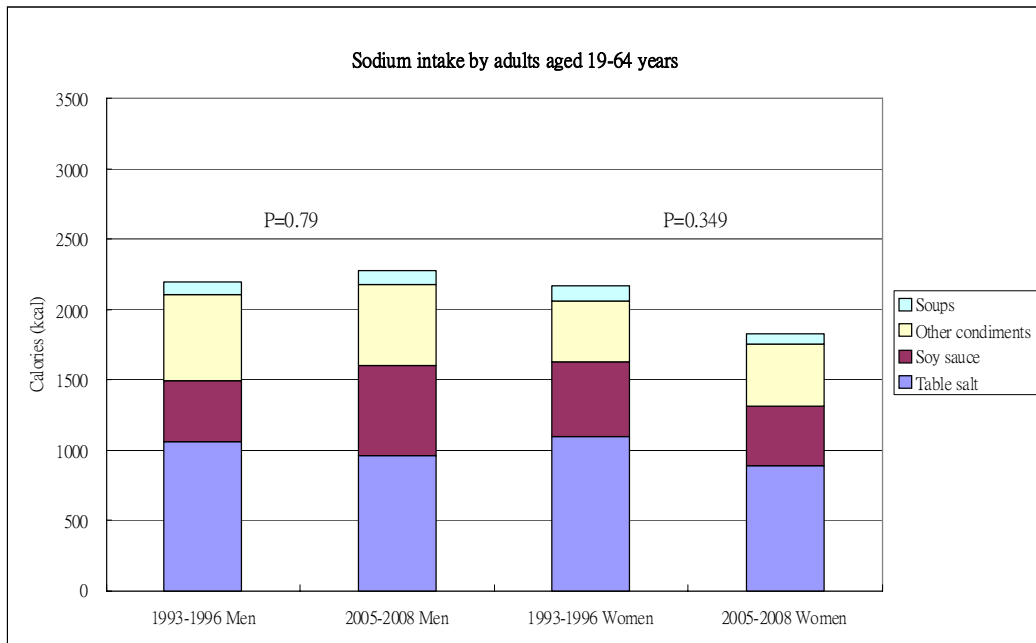


Figure 10. Trends in intake of high sodium foods (shown by sodium content) in adults aged 19-64 years. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

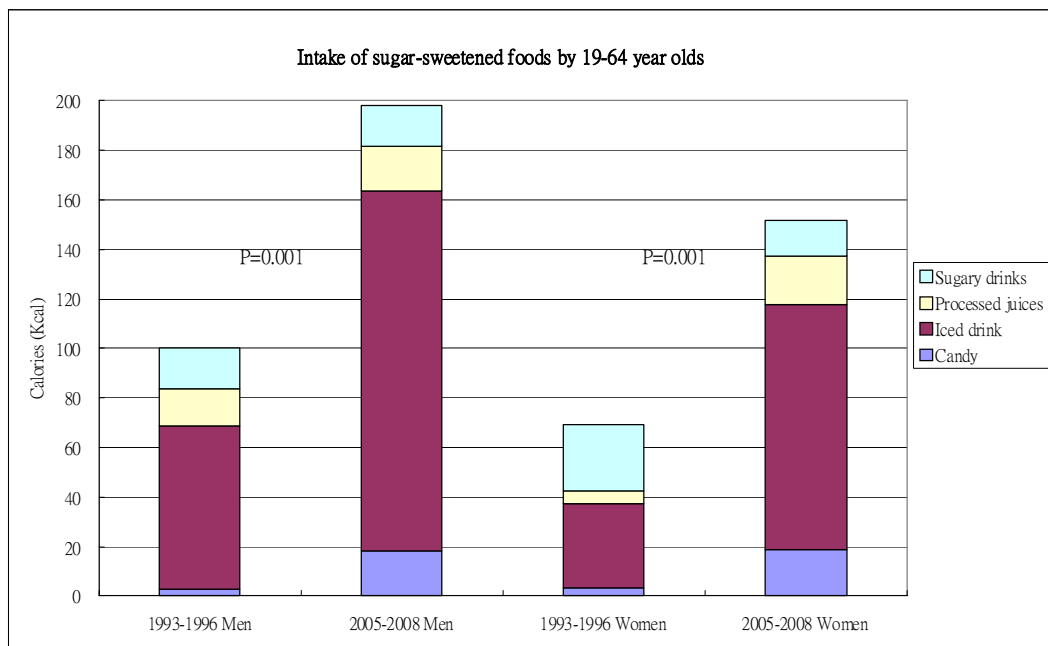


Figure 11. Trends in intake of sugar-sweetened foods (shown in energy) by adults aged 19-64 years. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

lence of hypertriglyceridemia increased from 13.4% to 20.8% in men and from 6.15% to 7.9% in women.

Hyperuricemia

The prevalence of hyperuricemia decreased in both men and women. Significance is shown in women only. About one in five men and 10% of women are hyperuricemic in the 2005-2008 survey.¹⁶

Hypertension

As blood pressure was measured in the 1993-1996 survey using a mercury manometer but was measured in the present survey with an electronic sphygmomanometer, we chose to compare the current survey findings with those

of the 2002 survey of hypertension, hyperglycemia and hyperlipidemia that also used an electronic blood pressure device. The prevalence of hypertension was very similar between both of these surveys. In the current survey, about one in five men and 13% of women have hypertension.

Anemia (Figure 13)

Anemia was defined using a strict cut-off of <13 mg/dL in men and <12 mg/dL in women. Before middle age, the prevalence of anemia was lower than 10% in men but was almost 20% in women. The prevalence of anemia in older men increased with age and by age 75 and above, 30-40% of men were anemic. In women, the prevalence of anemia

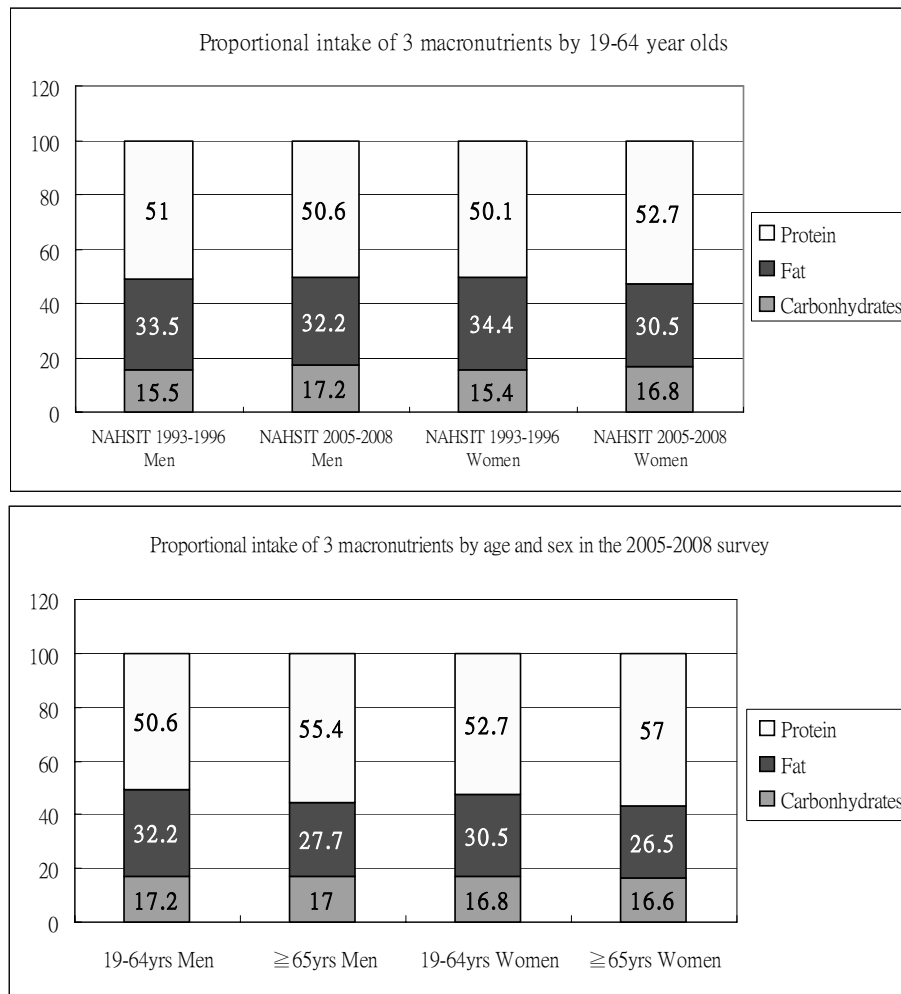


Figure 12. Trends in proportion of dietary intake from the three macronutrients in adults aged 19-64 years. Comparison of 24 hour dietary recall data from the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

in middle age (45-64 years) and early older age (65-74 years) was lower than that observed in younger women. However, at ages 75 and above, similar to that found in older men, the prevalence of anemia increased to about 30%. However, no statistical difference is detected between the two surveys.

DISCUSSION

Positive changes in the dietary habits of people in Taiwan in the past 10 years have been observed, including: an increase in the use of vegetable oil, an increased understanding of the importance of avoiding animal fat and foods fried in animal fat; increased intake of fruit and vegetables, soy products, fish, whole grains, and nuts and seeds; and decreased intake of red meat, carbohydrates and sodium. These findings suggest that public health education conducted by the government and community organizations has been effective in these areas. However, several negative trends were also observed, including: increased intake of instant noodles, cakes and biscuits, sweets, and sugary drinks, particularly in young people. Calorie intake also increased in young women and middle aged men, which is similar to trends in obesity. These findings demonstrate a mixed influences, from being health conscious (e.g. intake of whole grains and roots) to following popular trends (e.g. intake of western wheat-

based foods and convenience foods), on eating habits of the Taiwanese people.

In western countries, although great progress has been made in the last 10 years against cardiovascular disease, particularly coronary artery disease, obesity has become an increasingly difficult problem to control.¹⁹⁻²² International experts believe that this rapid rise in obesity is related to a sedentary lifestyle and lack of physical activity,¹⁸ growth in the popularity of fast food chains and sugar-sweetened drinks, and the provision of greater portion sizes, use of trans fatty acids and provision of energy dense foods by the food and beverage industry.^{21,22} Although the health and dietary transition in Taiwan is showing some similarities with that observed in western nations, it also has some specific characteristics.

Comparison of markers for cardiovascular disease and the metabolic syndrome between the 1993-1996 and 2005-2008 surveys showed that the greatest nutrition-related health problem in Taiwan is the rapid rise in the prevalence of obesity (including central obesity) and the associated metabolic syndrome, in particular the rise in diabetes and hypertriglyceridemia.¹⁵ As well as a sedentary lifestyle,⁴ the rapid rise in the prevalence of obesity, diabetes and hypertriglyceridemia could also be due to increased intakes of instant noodles, cakes, biscuits, candy, and sugary drinks that provide an increased sugar load whilst lacking micronutrients and trace elements.¹⁸

Table 2. Trends in the prevalence of obesity, the metabolic syndrome, diabetes, hyperlipidemia, hyperuricemia, and hypertension

Prevalence or mean	Men			Women		
	NAHSIT					
	1993~1996	2005~2008	<i>p</i> value	1993~1996	2005~2008	<i>p</i> value
Overweight/obesity (%)	33.4	51.0	<0.001†	33.5	35.9	0.165
Mean waist Circumference (cm)	78.9	84.0	<0.001†	72.6	76.6	<0.001†
Central obesity (%)	10.9	24.8	<0.001†	20.2	33.6	<0.001†
Diabetes (%)	3.2	12.0	0.001†	5.5	8.0	0.059
Hypertriglyceridemia (%)	13.4	20.8	0.034†	6.1	7.9	0.403
Hypercholesterolemia (%)	10.2	12.5	0.637	11.2	10.0	0.607
Hyperuricemia (%)	25.3	21.6	0.297	16.7	9.6	0.027†
Metabolic syndrome (%)	10.1	18.9	<0.001†	26.4	31.5	<0.001†
Hypertension (%)	TwHHH†	NAHSIT		TwHHH†	NAHSIT	
	20.5	20.9		13.2	13.4	

†2002 Survey of hypertension, hyperglycemia and hyperlipidemia in Taiwan¹⁷

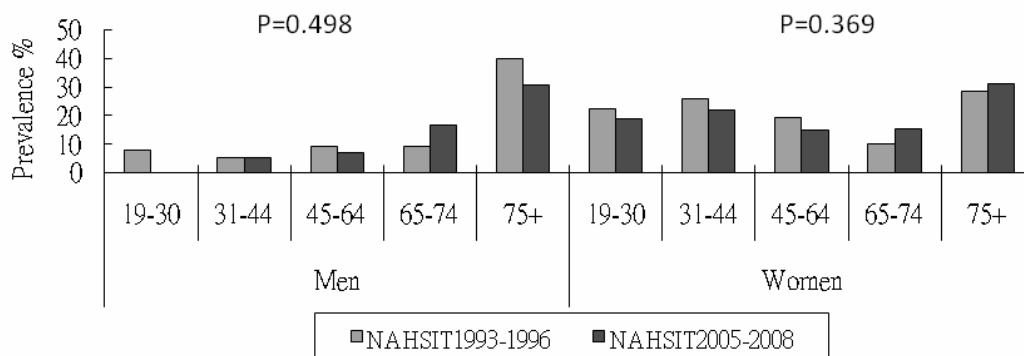


Figure 13. Trends in the prevalence of anemia by age and sex. Comparison of the 1993-1996 and 2005-2008 Nutrition and Health Surveys in Taiwan

Young people (19-30 years) are most likely to consume these types of foods which could explain their greater observed increase in calorie intake.

No large change in the prevalence of hypertension or hypercholesterolemia was observed during the 10 year period between surveys and the prevalence of hyperuricemia decreased slightly. As animal products are the major risk factor for raised cholesterol, blood pressure and uric acid levels, the lack of increase could be due to the decrease in animal fat used for cooking and a decrease in the proportion of people eating meat and poultry without the skin and fat removed. In addition, the large decrease in sodium intake in older people and the increased consumption of fruit and vegetables could have had a beneficial effect on blood pressure. A slight increase in sodium intake in young men remains a concern, particularly as sodium intake in males aged 19-64 years slightly increased. The majority of salt intake in Taiwan comes from table salt, soy sauce and other condiments. Reduced use of condiments in this age group could be an important

future intervention aimed at reducing sodium intake and blood pressure.

It is interesting to note that the prevalence of gout did not decrease alongside the reduction in hyperuricemia and in contrast actually increased slightly.¹⁶ Based on our own past research²³ and that of others, the metabolic syndrome is an important risk factor for gout in addition to hyperuricemia.²⁴ Therefore, the increase in prevalence of gout could be related to the rise in prevalence of the metabolic syndrome.

As obesity, particularly central obesity, has a close relationship with metabolic disorders, future public health policy in Taiwan should target the prevention and control of central obesity in order to better control associated cardiovascular and metabolic diseases. Effective strategies for obesity control should not only emphasize a reduction in the amount of food and energy consumed but also the intake of nutrient rich foods, as this approach would also help prevent the development of metabolic disorders.

The findings for anemia are very similar to those of the 1993-1996 survey and are similar to those reported by other developed countries.²⁵ They demonstrate that women of reproductive age, adolescents, and older people with a high prevalence of chronic disease have a higher prevalence of anemia, particularly iron deficiency anemia, than young men. This is an important issue that requires the development of effective interventions and public health policies.

There are several dietary issues exclusive to Taiwan that requires further elaboration. The majority of Taiwanese have traditionally used vegetable oil for cooking and the use of animal fat has always been low, apart from in rural areas populated by the Hakka ethnic group. The 2005-2008 survey found a further apparent decrease in the use of animal fat in Taiwanese aged 19-64 years and a slight increase in the intake of nuts and seeds. In both the 1993-1996 and the 2005-2008 survey, soybean oil was the most commonly used vegetable oil. However, in recent times there has been an increase in the variety of vegetable oils used in cooking with a substantial proportion of people using olive oil, sunflower oil, salad dressing, grape seed oil, and sesame oil. International research has been largely focused on reducing the use of animal fat and trans fatty acids, and it is uncommon to have such high usage rates of vegetable oil, as that observed in Taiwan. Consumption of vegetable oils by vegetarians in Taiwan is even greater than that observed for the general population,²⁶ and the dietary P/S ratios of vegetarians is above 3.²⁶ Research is currently lacking on the effects of an excessively high P/S ratio on overall health and this could be an important direction for future research.

Calcium status of the Taiwanese population is an important issue for nutritional education. National dietary guidelines have consistently recommended the intake of one to two glasses of skim or low-fat milk every day.²⁷ However, although public health organizations have been actively promoting increased consumption of dairy products for a number of years, as a means of improving calcium status of the Taiwanese population, intake of dairy products has decreased rather than increased. As a result, the findings for calcium in the current survey are even further away from the ideal recommended for the prevention of osteoporosis. Research is urgently needed for further understanding of the reasons behind Taiwanese people's rejection of dairy products and to estimate the health benefits and environmental risk factors associated with dairy product consumption.

Decreasing the intake of sugary drinks is another important issue for future nutrition education interventions. Older people are more likely to add sugar to their cooking and therefore, altering older people's taste for sweetened food is an important way of reducing sugar intake in this age group. Sugar-sweetened drinks are a new and widely popular food product. The contribution of such drinks to the increasing prevalence of obesity in Taiwan is an issue of major concern.²⁸

CONCLUSION

Some positive dietary changes have been observed in Taiwanese people in the past 10 years, including: increased use of vegetable oil and an understanding of the

importance of avoiding animal fat and related products; increased intake of fruit and vegetables, soy products, fish, whole grains, and nuts and seeds; and decreased intake of red meat, carbohydrates and sodium. However, some negative changes have also been observed, including: increased intake of instant noodles, cakes and biscuits, sweets, and sugary drinks, particularly in young people. This increase in intakes of unhealthy foods coincides with trends in obesity. In addition, despite active promotion of increased dairy consumption, intake of dairy products in Taiwan has actually decreased and is far from the intake recommended for the prevention of osteoporosis.

The most serious dietary problem in Taiwan is the rapid increase in the prevalence of obesity (including central obesity) and associated metabolic disorders, such as diabetes and hypertriglyceridemia. In addition to an increasingly sedentary lifestyle, the rise in obesity and metabolic disorders could be due to the increased intake of foods with low nutrient density and high glycemic index. Young people (aged 19-30 years), in particular, are likely to have high intakes of such foods.

No large changes were observed in the prevalence of hypertension or hypercholesterolemia and the prevalence of hyperuricemia decreased. This is possibly due to a reduction in the use of animal fat for cooking, a decrease in eating meat without removing skin and visible fat, large reductions in sodium intake in older people, and increased intake of fruit and vegetables. However, despite the decrease in hyperuricemia, the prevalence of gout slightly increased. This could be due to the increased prevalence of metabolic disorders.

RECOMMENDATIONS

It is vital to continue promoting dietary guideline and food guides established for the contemporary Taiwanese. In particular, awareness of the negative health effects of sugary drinks should be strengthened. Especially in young people, the replacement of sugar-sweetened drinks and other simple sugar made sweets with naturally sweet products such as fruit, dried fruit and 100% fruit juice should be emphasized. People should be more informed about obesity and the metabolic syndrome, particularly the harms associated with these conditions and how they can be prevented through a healthy diet and lifestyle. Improvements to the macro-environment are also important such as increasing the accessibility of healthy foods and physical activity spaces. Further research is needed into the reasons behind the dislike for dairy products in Taiwan, as well as the development of effective strategies to increase intakes of low fat dairy products. In addition, research could investigate alternative ways of improving calcium intake other than promoting dairies in the Taiwanese population.

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AUTHOR DISCLOSURES

Wen-Harn Pan, Hsing-Juan Wu, Chih-Jung Yeh, Shao-Yuan Chuang, Hsing-Yi Chang, Nai-Hua Yeh, Yao-Te Hsieh, no conflicts of interest.

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Original Article

Diet and health trends in Taiwan: comparison of two nutrition and health surveys from 1993-1996 and 2005-2008

Wen-Harn Pan PhD^{1,2,3}, Hsing-Juan Wu MS⁴, Chih-Jung Yeh PhD⁵,
Shao-Yuan Chuang PhD¹, Hsing-Yi Chang PhD¹, Nai-Hua Yeh MS^{1,2},
Yao-Te Hsieh MS¹

¹Nutrition Medicine Research Program, Division of Preventive Medicine and Health Sciences Research, Institute of Population Health Sciences, National Health Research Institute, Miaoli, Taiwan

²Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan

³Department of Biochemical Science and Technology, National Taiwan University, Taipei, Taiwan

⁴Department of Food and Nutrition, Chung Hwa University of Medical Technology, Tainan, Taiwan

⁵Department of Public Health, Chung-Shan Medical University, Taichung, Taiwan

臺灣人飲食與健康之趨勢：1993-1996 與 2005-2008 兩次營養健康調查之比較

近年來食品新的選擇、新的口味層出不窮，而靜態的生活使得熱量需求減少。本文分析比較 1993-1996 與 2005-2008 兩次臺灣營養健康調查之 24 小時飲食回憶以及體檢所得臨床生化、人體測量資料，探討 19 歲（含）以上成人飲食型態、心臟血管代謝疾病與指標之趨勢。本研究發現臺灣人飲食型態正在轉型中，特別是糕餅甜食、加糖飲料的風行，年輕人卡路里攝取量增加，同時由於生活方式日趨靜態，使得肥胖及其相關代謝疾病：代謝症候群、糖尿病、高三酸甘油脂症、痛風盛行率大幅增加。所幸，有一些正向的飲食型態改變，包括：使用植物油的比率增加，民眾懂得避免動物性脂肪和油炸食品，另外蔬果、黃豆製品、魚、全穀類、核果種子等的攝取量增加，紅肉類、醣類、和鈉的攝取量減少等。可能因此，高血壓與高血膽固醇的盛行率改變不大，高尿酸血症盛行率下降。奶類攝取量持續偏低，無法提升，是一值得關注的問題。持續推動減脂、減鈉、多蔬果飲食；並應針對加糖飲料的危害加強宣導，特別要著力在年輕人群，強調以本態性的甜食，如水果、果乾、百分之百果汁等取代加糖飲料和其他甜食。加強民眾對肥胖代謝症候群的定義、其健康危害、以及其防治飲食及生活形態的瞭解，並改善大環境，提高健康飲食和體能活動場所的可近性。應積極探討國人不喜歡奶類的原因，以有效提升低脫脂奶類攝取量，或研發提升鈣質的其他替代方案。

關鍵字：臺灣營養健康調查 2005-2008、趨勢、健康指標、疾病指標、飲食習慣、飲食型態