

Nutritional counselling in general practice: a cost effective analysis

Douglas Alexander Pritchard, Jilda Hyndman, Forough Taba

Abstract

Study objective—To study the clinical and cost outcomes of providing nutritional counselling to patients with one or more of the following conditions: overweight, hypertension and type 2 diabetes.

Design—The study was designed as a random controlled trial. Consecutive patients were screened opportunistically for one or more of the above conditions and randomly allocated to one of two intervention groups (doctor/dietitian or dietitian) or a control group. Both intervention groups received six counselling sessions over 12 months from a dietitian. However, in the doctor/dietitian group it was the doctor and not the dietitian who invited the patient to join the study and the same doctor also reviewed progress at two of the six counselling sessions.

Setting—The study was conducted in a university group general practice set in a lower socioeconomic outer suburb of Perth, Western Australia.

Patients—Of the 273 patients randomly allocated to a study group, 198 were women. Age ranged from 25 to 65 years. Seventy eight per cent of patients resided in the lower two socioeconomic quartiles, 56 per cent described their occupation as home duties and 78 per cent were part-nered.

Results—Both intervention groups reduced weight and blood pressure compared with the control group. Patients in the doctor/dietitian group were more likely to complete the 12 month programme than those in the dietitian group. Patients in the doctor/dietitian group lost an average of 6.7 kg at a cost of \$A9.76 per kilogram, while the dietitian group lost 5.6 kg at a cost of \$A7.30 per kilogram.

Conclusion—General practitioners, in conjunction with a dietitian, can produce significant weight and blood pressure improvement by health promotion methods.

(*J Epidemiol Community Health* 1999;53:311–316)

It has been stated often that general practitioners are well placed to promote the health of patients.^{1,2} Surveys in general practice in England and Australia have suggested that only low levels of health promotion occur and that the expectations of patients for advice on lifestyle matters are not being met.^{3–5} However, general practitioners can be effective in health promotion and they have already been shown to be

effective counsellors in smoking and alcohol reduction.^{1,2}

Overweight and hypertension are two conditions encountered frequently in general practice.^{6,7} Screening or counselling for hypertension was the most frequent risk reduction activity carried out in a recent survey of general practice in Australia.⁶ Overweight, however, was considered much less frequently⁶ despite being twice as prevalent in general practice⁷ and having its own association with hypertension, type 2 diabetes, and coronary heart disease.^{8,9} General practitioners feel they have little success in treating overweight.¹⁰ Important structural, training and personal issues for the doctor remain as barriers to the weight management in general practice.¹¹ Lack of time and trained support staff have been particular problems.¹²

General practice, however, can provide the setting for nutritional education to improve blood pressure and weight. Croft and colleagues were able to produce significant improvements in the weight and blood pressure of newly diagnosed overweight hypertensive patients attending an English urban group practice.¹³ Over a period of 12 months, the patients were seen every eight weeks for blood pressure checks by the doctor and attended a clinic staffed by dietitians in the general practice. Forty five per cent dropped out. Patients who were overweight but not hypertensive also responded to the nutritional advice, but generally lost less weight than those with hypertension. However 73% dropped out. Neil and colleagues, in a more recent randomised trial in an English general practice, examined the efficacy of nutritional advice given to patients with raised cholesterol by one of three interventions: counselling by a dietitian, counselling by a practice nurse and the provision of a diet leaflet.¹⁴ The patients' general practitioners were not involved in the interventions. Although only 13% dropped out, the study failed to show a reduction in body mass index, or other outcome measures, in six months. The authors concluded that a more intense intervention was required than was normally available in general practice.

In a community health setting, however, Johnston and colleagues found no relation between intensity of health promotion and outcome.¹⁵ Patients with raised cholesterol were recruited at community health screening clinics in Sydney. Three levels of intervention were tested: counselling by a dietitian on recruitment, counselling by a dietitian on three occasions in a group and individual counselling by a dietitian. No difference was found

Department of
General Practice, The
University of Western
Australia
D A Pritchard

Department of Public
Health, The University
of Western Australia,
Crawley, Western
Australia
J Hyndman

Lockridge General
Practice, Lockridge,
Western Australia
D A Pritchard
F Taba

Correspondence to:
Dr D Pritchard, Lockridge
General Practice, 32 Weddall
Road, Lockridge, Western
Australia, 6054.

Accepted for publication
18 November 1998.

between the three levels, at the end of a six month study, with respect to weight loss or cholesterol levels, nor with respect to an average drop out rate of 27%.

While the Neil and the Croft studies both had the advantage of stable general practice lists, Croft used a more intense intervention and enlisted the patient's general practitioner in the health promotion exercise. These two factors probably contributed to the improved patient outcomes. The ability to attain such results in an Australian general practice, without a stable practice list, is uncertain.

This study examined the clinical and cost outcomes of nutritional counselling for patients diagnosed with one or more of the conditions: overweight, hypertension and type 2 diabetes. The study also examined whether the outcome and the drop out rate was improved if the general practitioner both invited the patient to participate in nutritional counselling and monitored the patient's progress.

Method

The study took place in a university general practice at Lockridge, near Perth, Western Australia between November 1992 and May 1994 and employed a dietitian. Consecutive patients aged between 25 and 65 years inclusive were screened opportunistically by the study dietitian as they attended the practice to see a general practitioner. Patients with a pre-existing diagnosis of overweight, hypertension or type 2 diabetes, determined from the patient notes, were invited to participate in screening. Patients without a pre-existing diagnosis recorded in the notes, but who appeared to be overweight on presentation at reception, were also invited to participate. Patients were excluded from the study if they were mentally ill, intellectually handicapped, terminally ill, acutely ill, pregnant or participating in other health education programmes.

Screening measurements were made as follows:

Body weight and height were measured with patients wearing only light indoor clothing. Body weight was measured on digital balance scales to the nearest 0.1 kg with the patient wearing no shoes. Height was measured to the nearest 1 cm, using a rigid tape measure fixed to a wall. Patients with a body mass index (BMI) of more than 25 were diagnosed as overweight.

Blood pressure was taken from the left arm in the sitting position using a mercury sphygmomanometer and appropriately sized cuff. As the cuff deflated the first occurrence of sound was taken as systolic and the disappearance of sound as diastolic pressure. If a patient was not taking anti-hypertension medication, a diagnosis of hypertension was made when the screened blood pressure was more than 140/90 mm Hg and a blood pressure reading of more than 140/90 had been recorded at least twice in the patient's notes.

For diabetic patients, an Ames pen was used to obtain a capillary sample that was read with an Ames-3 glucometer to obtain a random glu-

cose level. Venous blood was also taken from diabetic patients for glycosylated haemoglobin at the beginning and the end of the study.

Marital status, occupation and a list of current medication were recorded.

SAMPLE SIZE

Based on an expected 5% weight reduction in the dietitian group and 10% in the doctor/dietitian group, a minimum of 35 overweight patients per group was required to achieve a power of 0.9 that the null hypothesis would be rejected at the 0.5 level.

ALLOCATION TO GROUPS

Immediately after screening, the study dietitian used a table of random numbers to allocate each consecutive patient with a diagnosis of one or more of overweight, hypertension and type 2 diabetes to one of the following three groups.

DIETITIAN GROUP

Patients allocated to the dietitian group were invited to join the study by the dietitian at the time of screening. The dietitian conducted six individual counselling sessions, spaced equally, with the last session 12 months after recruitment. The initial session occupied 45 minutes, with 15 minutes for later sessions. Measurements were repeated at all sessions under similar conditions.

Counselling focused on principles of good nutrition and exercise. The dietitian questioned life style and dietary patterns to identify problem areas. Counselling included advice on food shopping and cooking methods, food selection, meal planning, and exercise programmes. Patient kept food records and diet history were used in the counselling sessions to provide individual advice. Recommendations included restriction of total dietary energy, reduction of the fat component to no more than 30%, with carbohydrate contributing 50% or more and protein the balance. Smoking was discouraged. Alcohol consumption of no more than two standard drinks a day for women and four for men was recommended, with at least two alcohol free days a week.

DOCTOR/DIETITIAN GROUP

After screening, the dietitian flagged the patient record to request the general practitioner, with whom the patient had made an appointment, to invite the patient to join the study. Patients saw the same general practitioner on two other occasions during the 12 months to encourage the patient and monitor progress.

The dietitian coordinated the follow up appointments and flagged the patient record with progress measurements to enable the general practitioner to discuss progress with the patient. Five minutes of general practitioner time was allocated to these tasks. Otherwise, treatment was the same as for the dietitian group.

CONTROL GROUP

The control group received the results of the initial measurements and if they had queries

were advised to discuss these with the doctor with whom they had made an appointment. No counselling was given by the dietitian. If patients asked the doctor about the measurements, they were treated as any other patient attending the practice. The fact that they were in the control group did not prevent the doctor from providing care usually provided for such conditions. This could include monitoring, advice and prescriptions, but not referral to the study's dietitian. After 12 months, they received one mailed invitation to attend for reassessment of the initial measurements.

In accordance with protocol, doctors were never informed about who was in the control and the dietitian groups. If a patient who was not in the doctor/dietitian asked about screening results, the doctor would not know to which group, if any, the patient belonged.

SOCIOECONOMIC STATUS

Patients were classified into one of four quartiles of socioeconomic status based on their home address using the socioeconomic status indices for small areas produced by the Australian Bureau of Statistics in 1991.¹⁶

OUTCOME AND STATISTICAL ANALYSIS

Data were recorded using Epi-info¹⁷ and analysed using SAS.¹⁸ A χ^2 test was used to compare the demographic composition of the study groups. Confidence intervals for differences in means were used to compare groups with respect to outcome measurements.

The main outcomes evaluated were changes in weight and mean blood pressure (diastolic pressure + (systolic-diastolic pressure)/3) for each of the three groups. These outcomes were subjected to analysis by intention to treat, which assumed that a patient's measurements remained unchanged after the patient dropped out of the study.¹³ Thus a patient's last measurement was used to populate all subsequent missing data values.

COST EFFECTIVENESS ANALYSIS

The dietitian maintained a record of activities for two periods of two weeks during the study. All costing was estimated in 1993/94 values. Time spent on the study tasks of screening, arranging appointments, changing appointments, drawing patient files, data entry, and counselling was recorded. The time was costed at \$20 per hour for the dietitian. Time spent by the patient with the doctor was costed at \$82 per hour, which was the equivalent cost of bulk billing four standard consultations. Materials used by the dietitian, room rental and usual

practice overheads were costed and distributed according to the number of counselling sessions taken up by patients in the three groups. The cost effectiveness analysis was used to determine a cost for each intervention in terms of weight change over and above that of the screening group.

MEDICATION USE

Cardiovascular medications used by each patient with hypertension were recorded at screening. Changes were noted at later sessions. To compare medication use by the three groups, the defined daily dose as described in the WHO system was calculated for each patient.¹⁹⁻²¹ Defined daily dose is the assumed average dose per day for the drug used in its main indication in adults. Only medicines coded in the ATC grouping C: Cardiovascular system, were included in the study.

Results

Of 296 patients offered screening, 23 refused screening and 21 declined to participate in the study after screening for reasons that included lack of time or interest, already waited too long to see a doctor, job loss and feeling depressed. There was no significant difference between patients who enrolled and those who declined, with respect to screened measurements.

COMPARISON OF STUDY GROUPS

Seventy five men and 198 women participated in the study, consistent with the practice's overall attendance pattern of 28% men to 72% women. There was no significant difference between intervention and control groups with respect to sex ($\chi^2=3.49$, $p=0.18$, $df=2$) or age where 73 percent of patients were less than fifty years old ($\chi^2=9.44$, $p=0.31$, $df=8$).

There was no significant difference between the groups by socioeconomic status quartiles or occupation. The most disadvantaged quartile contained 58% of patients, 20% were more disadvantaged, 20% less disadvantaged and 2% were least disadvantaged. Occupation was recorded as home duties by 56% of patients (84% female), trade/driver/labourer by 20%, unemployed by 6%, clerical/sales by 14%, manager/professional 4%. Thirty eight per cent of patients worked away from home. While 22% were without partners, 78% were married or de facto.

No significant differences were found between the three groups in the frequency of diagnoses. Overweight alone accounted for 62% of patients. A further 31% of patients had overweight and hypertension, 2% were overweight and diabetic and 4% had all three conditions. The remaining 1% had either diabetes or hypertension. Table 1 compares the screening measurements of patients in the three groups after randomisation.

DROP OUT RATES

Table 2 shows the number of patients who attended all sessions and the number with each condition who dropped out. Of the initial 273 patients recruited, 177 (65%) finished all sessions. The drop out rate of overweight

Table 1 Comparison of average screening measurements of patients in each group by condition

| Condition | Control group | | Doctor/dietitian group | | Dietitian group | |
|------------------|---------------|----|------------------------|----|-----------------|----|
| | Mean | n* | Mean | n | Mean | n |
| Overweight | 89.1 kg | 90 | 91.7 kg | 92 | 85.5 kg | 88 |
| Hypertension† | 110 mm Hg | 34 | 112 mm Hg | 33 | 109 mm Hg | 30 |
| Type 2 diabetes‡ | 7.7% | 6 | 8.0% | 6 | 8.2% | 5 |

* Number of patients in the group with the condition; a patient may have more than one condition. † Expressed as mean blood pressure=diastolic blood pressure+(systolic blood pressure-diastolic blood pressure)/3. ‡ % glycated haemoglobin.

Table 2 Comparison of control and intervention groups showing the average final measurement and its percentage change from screening for all patients with each condition, patients completing all sessions, and drop outs

| Condition | Control group | | | Doctor/dietitian Group | | | Dietitian group | | |
|------------------|---------------|-----------|----|------------------------|----------|----|-----------------|----------|----|
| | Mean | % change* | n | Mean | % change | n | Mean | % change | n |
| Overweight | | | | | | | | | |
| All patients | 89.7 kg | 101 | 90 | 85.5 kg | 93 | 92 | 80.4 kg | 94 | 88 |
| Completed | 91.7 kg | 103 | 64 | 82.7 kg | 90 | 65 | 76.6 kg | 90 | 48 |
| Drop outs | 85.0 kg | 95 | 26 | 89.9 kg | 98 | 27 | 84.9 kg | 99 | 40 |
| Hypertension† | | | | | | | | | |
| All patients | 112 mm Hg | 102 | 34 | 102 mm Hg | 92 | 33 | 104 mm Hg | 95 | 30 |
| Completed | 112 mm Hg | 102 | 28 | 100 mm Hg | 89 | 24 | 98 mm Hg | 90 | 14 |
| Drop outs | 113 mm Hg | 103 | 6 | 108 mm Hg | 96 | 9 | 109 mm Hg | 100 | 16 |
| Type 2 diabetes‡ | | | | | | | | | |
| All patients | 7.8% | 101 | 6 | 7.2% | 90 | 6 | 8.2% | 100 | 5 |
| Completed | 7.8% | 101 | 6 | 6.7% | 84 | 5 | 6.1% | 74 | 3 |
| Drop outs | — | — | 0 | 9.2% | 115 | 1 | 10.3% | 126 | 2 |

* % change=(average final measure/average screening measure of all patients in group with the condition)×100. † As mean blood pressure=diastolic blood pressure+(systolic blood pressure–diastolic blood pressure)/3. ‡ % glycated haemoglobin.

patients in the dietitian group (45%) was significantly greater than the 29% for both the doctor/dietitian group ($\chi^2=5.27$, $p=0.022$, $df=1$) and the control group ($\chi^2=5.32$, $p=0.021$, $df=1$). For overweight patients who were not hypertensive, 63% of control, 70% of doctor/dietitian and 59% of dietitian patients attended all sessions, with no difference between the three groups.

There was no difference between the control and doctor/dietitian groups with respect to the proportion of hypertensive patients who attended all sessions. Significantly fewer dietitian patients attended all sessions compared with the control group ($\chi^2=9.01$, $p=0.003$, $df=1$) and the doctor/dietitian group ($\chi^2=4.49$, $p=0.035$, $df=1$).

WEIGHT OUTCOMES

In an intention to treat analysis, the doctor/dietitian group lost 6.7 kg or 7.3% of screening weight compared with the control group (95% CI: 6.5%, 8.3%) while the dietitian group lost 5.6 kg or 6.6% (95% CI: 5.8%, 7.6%). The doctor/dietitian group lost 1.1 kg or 0.7% more weight than the dietitian group but this was not statistically significant (95% CI: -0.42%, 1.82%). Table 2 shows that those who dropped out of the intervention groups had achieved similar outcomes at the last session they attended. Analysis only of patients who attended all sessions showed doctor/dietitian patients were 8.1 kg or 8.8% lighter than their screening weight (95% CI: 8.0%, 9.6%) and dietitian patients lost 7.7 kg or 9.1% (95% CI: 8.0%, 10.2%).

Table 3 Analysis of cost for weight change* of all allocated‡ patients in each group on the basis of intention to treat

| | Group | | |
|---|-----------|------------------|-----------|
| | Control | Doctor/dietitian | Dietitian |
| Total cost per group‡ | \$2103.53 | \$8240.30 | \$5715.06 |
| Number of patients | 91 | 93 | 89 |
| Cost per patient | \$23.12 | \$88.61 | \$64.21 |
| Additional cost per patient | \$0.00 | \$65.49 | \$41.09 |
| Weight change per patient (kg) | 0.58 | -6.13 | -5.05 |
| Additional weight change per patient (kg) | | -6.71 | -5.63 |
| Additional cost per kg lost | | \$9.76 | \$7.30 |

* Weight change was the difference between the first and last measure for each patient. † Allocated patients: all patients who agreed to be screened and were allocated to a study group. ‡ The analysis includes all drop outs from all groups.

BLOOD PRESSURE OUTCOMES

By intention to treat analysis, the doctor/dietitian and dietitian groups both had significant change in final mean blood pressure relative to the control group with falls of 12 mm Hg or 12% (95% CI: 9%, 15%), and 7 mm Hg or 7% (95% CI: 4%, 10%) respectively. The doctor/dietitian group, however, lowered mean blood pressure by 5 mm Hg or 5% (95% CI: 2%, 8%) more than the dietitian group. Analysis only of patients who attended all sessions showed doctor/dietitian patients were 14 mm Hg or 12% less than their screening mean blood pressure (95% CI: 8%, 16%) and dietitian patients were 7 mm Hg or 7% lower (95% CI: 1, 13).

TYPE 2 DIABETES OUTCOMES

Table 2 shows the final glycated haemoglobin measures for patients who attended all sessions compared with those who dropped out. No significant difference was found between control and intervention groups by an intention to treat analysis.

MEDICATION USE

No significant difference was found in the average defined daily dose of cardiovascular drug use by patients in the three groups on recruitment or at the final counselling session. Nineteen control patients were taking an average of 2.1 defined daily doses (95% CI: 1.4, 2.8), 21 doctor/dietitian patients were taking 3.2 (95% CI: 1.9, 4.5) and 16 dietitian patients were taking 1.8 (95% CI: 0.8, 2.8) at the end of the study.

COST EFFECTIVENESS ANALYSIS

Table 3 shows the results of the cost effectiveness analysis for weight loss. All patients who were both screened and allocated to a group were included in this analysis. Compared with the control group, the cost of an extra kilogram of weight loss for the doctor/dietitian group was \$9.76 and for the dietitian group it was \$7.30.

Discussion

This study has shown that an Australian general practice can employ a dietitian to produce significant weight reduction in overweight patients. Compared with commercial, balanced nutrition weight reduction programmes, costed

in Switzerland (Swiss francs 30.4 (\$A31.02) per kilogram weight loss over 32 weeks)²² and America (American dollars 13.5 (\$A19.29) per kilogram over 12 weeks),²³ weight loss was achieved at considerably less cost in both of this study's intervention groups. The associated decreases in blood pressure were achieved at no further cost and without recourse to increased medication.

The doctor/dietitian intervention was designed to examine the importance of the patient's doctor as a motivator of the patient's response to nutritional counselling. Significantly more patients in this group attended all counselling sessions compared with the dietitian group. Although the cost of weight loss was greater than for the dietitian group, overweight patients in the doctor/dietitian group lost more weight and hypertensive patients achieved a greater decrease in blood pressure. The higher attendance by the doctor/dietitian group contributed to the increased cost, but the main cost difference between the two intervention groups was the 23% of cost attributable to the doctor's time.

Croft *et al*¹³ suggested that electing to treat overweight can lead to a drop out of patients. As evidence they cited the 5% drop out rate in their control group where measurements were taken 12 months apart without any intervention, compared with a drop out of 73% of non-hypertensive dieters and 45% of hypertensive dieters. While the absence of a stable patient list probably contributed to the loss of 29% of our control patients, patient loss was no greater for the doctor dietitian group. In contrast, patient loss in the dietitian group was significantly higher.

Once having dropped out of the current study's doctor/dietitian group, however, patients could be disinclined to return to the inviting doctor because of feelings of failure. Loss of patients from care would be important for a general practitioner who considers such a nutritional intervention. Nevertheless the retention rate of patients in the doctor/dietitian group after 12 months compared favourably with the retention rates found by Croft *et al*¹³ and Johnston *et al*.¹⁵ This is encouraging for Australian general practice where the absence of formal practice lists is seen as a barrier to continuity of care and preventive care.²⁴ Further research is needed to determine if outcomes are sustained beyond the intervention period.

Most of the study's patients were from socioeconomically disadvantaged areas. Although research shows only small differences in nutrient intakes across socioeconomic groups²⁵ and that low income families are concerned about healthy nutrition,²⁶ the wider application of this study's findings remains to be investigated. In addition, most Australian general practitioners cannot afford to employ a dietitian, and without subsidy, direct cost to the patient would restrict the use of these interventions to patients with sufficient means.

A further issue regarding the results is that consecutive patients were recruited by the dietitian in so far as the dietitian was present

KEY POINTS

- General practice can use in house dietitian services and improve health outcomes of overweight and hypertensive patients..
- A 12 month nutritional intervention improved weight and blood pressure cost effectively, with no increase in medication use.
- Drop out from treatment is reduced if the general practitioner invites a patient to undertake the nutritional intervention and reviews progress.

and able to offer screening at the reception desk when a patient arrived. This had the potential to introduce bias if the dietitian was forced to choose between two or more patients arriving at the desk at the same time, because of insufficient time to screen and randomise them all. In addition, a total of 25 unscreened patients were referred directly to the dietitian by a general practitioner. These patients were excluded from the study analysis because they were not randomly allocated.

This study indicates that general practice can provide health promotion to improve overweight and hypertension at a reasonable cost, over a 12 month period, with a combination of the skills of the dietitian and the patient's general practitioner. The general practitioner's contribution increases the cost of the health promotion, but leads to fewer drop outs from the programme and outcomes better than those achieved by the dietitian alone.

The researchers are grateful for the generous cooperation given by the doctors and staff of Lockridge General Practice.

Funding: the research was funded by a grant from the Western Australian Health Promotion Foundation.

Conflicts of interest: none.

Ethics approval was obtained from the Committee of Human Rights, The University of Western Australia.

- 1 Jamrozik K, Vessey M, Fowler G, *et al*. Controlled trial of three different anti-smoking interventions in general practice. *BMJ* 1984;288:1499-503.
- 2 Wallace P, Cutler S, Haines A. Randomised controlled trial of general practice intervention in patients with excessive alcohol consumption. *BMJ* 1988;297:663-8.
- 3 Slama KJ, Redman S, Cockburn J, *et al*. Community views about the role of general practitioners in disease prevention. *Fam Pract* 1989;6:203-9.
- 4 Silagy C, Muir J, Coulter A, *et al*. Lifestyle advice in general practice: rates recalled by patients. *BMJ* 1992;305:871-4.
- 5 Richmond R, Kehoe L, Heather N, *et al*. General practitioners' promotion of healthy lifestyles: what patients think. *Aust N Z J Public Health* 1996;20:195-200.
- 6 Heywood A, Ring I, Sanson-Fisher R, *et al*. Screening for cardiovascular disease and risk reduction counselling behaviours of general practitioners. *Prev Med* 1994;23:292-301.
- 7 Anonymous. British family heart study: its design and method, and prevalence of cardiovascular risk factors. Family heart study group. *Br J Gen Pract* 1994;44:62-7.
- 8 Larsson B, Svardsudd K, Welin L, *et al*. Abdominal adipose tissue distribution, obesity and risk of cardiovascular disease and death: 13 year follow up of participants in the study of men born in 1913. *BMJ* 1984;288:1401-4.
- 9 Loos CA, Halais CM. Waist:hip ratio versus body mass index-screening for cardiovascular disease. *Australian Journal of Nutrition and Dietetics* 1992;48:113-17.
- 10 Cade J, O'Connell S. Management of weight problems and obesity: knowledge, attitudes and current practice of general practitioners. *Br J Gen Pract* 1991;41:147-50.
- 11 Ammerman A, DeVellis RF, Carey TS, *et al*. Physician-based diet counselling for cholesterol reduction: current practices determinants, and strategies for improvement. *Prev Med* 1993;22:96-109.
- 12 Bruce N, Bennett S. Prevention of lifestyle related disease: general practitioners' views about their role, effectiveness and resources. *Fam Pract* 1991;8:373-7.

- 13 Croft PR, Brigg S, Smith S, *et al.* How useful is weight reduction in the management of hypertension? *J R Coll Gen Pract* 1986;**36**:445-8.
- 14 Neil HA, Roe L, Moore JW, *et al.* Randomised trial of lipid lowering dietary advice in general practice: the effects on serum lipids, lipoproteins, and antioxidants. *BMJ* 1995;**310**:569-73.
- 15 Johnston HJ, Jones M, Ridler-Dutton G, *et al.* Diet modification in lowering plasma cholesterol levels. A randomised trial of three types of intervention. *Med J Aust* 1995;**162**:524-6.
- 16 Hyndman JCG, Holman CDJ, Hockey RL, *et al.* Misclassification of social disadvantage based on geographical areas: comparison of post code and collector's district analyses. *Int J Epidemiol* 1995;**1**:165-76.
- 17 Epi-Info version 5. Stone Mountain, Georgia: USD Inc, 1991.
- 18 SAS. Statistical Inst Inc. Cary, NC: SAS System, 1992.
- 19 World Health Organisation Collaborating Centre for Drug Statistics Methodology. *Guidelines for defined daily dose*. Oslo: World Health Organisation, 1991.
- 20 Nordic Council on Medicines. *Nordic Statistics on Medicines 1990-1992*. Uppsala: NLN Publication No 34, 1993.
- 21 Maxwell M, Heaney D, Howie JGR, *et al.* General practice fundholding: observations on prescribing patterns and costs using the defined daily dose method. *BMJ* 1993;**307**:1190-4.
- 22 Muller B, Abelin T. Evaluation of advertisements of weight-reducing cures in the press. *J Suisse Med* 1994;**124**:749-58.
- 23 Spielman AB, Kandars B, Keinholtz, *et al.* The cost of losing: an analysis of commercial weight-loss programs in a metropolitan area. *J Am Coll Nutr* 1992;**11**:36-41.
- 24 Harris MF, Frith JF. Continuity of care: in search of the Holy Grail of general practice. *Med J Aust* 1996;**164**:456-7.
- 25 Smith AM, Baghurst KI. Public health implications of dietary differences between social status and occupational category groups. *J Epidemiol Community Health* 1992;**46**:409-16.
- 26 Crotty PA, Rutishauser IH, Cahill M. Food in low income families. *Aust J Public Health* 1992;**16**:168-74.