

Estimation of Human Resources Needs and Costs of Adding
Registered Dietitians to Ontario Family Health Networks



**Nutrition in
Primary Health**

Estimation of Human Resources Needs and Costs of Adding Registered Dietitians to Ontario Family Health Networks

Authors:

Julia Witt, PhD
Melbourne Institute of Applied Economic and Social Research
The University of Melbourne
161 Barry Street, Level 6
Parkville, VIC 3078, Australia

Paula Brauer, PhD, RD
Department of Family Relations and Applied Nutrition
University of Guelph
50 Stone Road West
Guelph, ON N1G 2W1

Linda Dietrich, MEd, RD
Regional Executive Director
Dietitians of Canada
480 University Avenue, Suite 604
Toronto, ON M5G 1V2

Bridget Davidson, MHSc, RD
Project Coordinator
788 Avondale Avenue
Kitchener, ON N2M 2W8

Steering Committee:

Paula Brauer, PhD, RD
Linda Dietrich, MEd, RD
Bridget Davidson, MHSc, RD
John Krauser, Primary Health Care Team, Ministry of Health and Long-Term Care, Toronto, ON
Karen Parsons, Primary Health Care Team, Ministry of Health and Long-Term Care, Kingston, ON

Suggested Citation: Davidson B, Dietrich L, Brauer P, Witt J. Estimation of Human Resources Needs and Costs of Adding Registered Dietitians to Ontario Family Health Networks. Toronto: Dietitians of Canada, 2006. At: www.dietitians.ca

Funded by the Ontario Primary Health Care Transition Fund, 2004-2006. This report does not represent the official policy of the funding partners, the Ontario Ministry of Health and Long-Term Care or other organizations.

Acknowledgments

The authors gratefully acknowledge Theresa Schneider, Deborah Northmore and Eva West, the Registered Dietitians who participated in this study, for their commitment to professional accountability. Their dedication in completing the forms and questionnaires under the constraints of “real world” practice was critical to successful completion of the costing analysis. The staff at each of the three Family Health Networks (FHNs) must also be acknowledged, as this costing analysis would not have been possible otherwise. The commitment of each lead physician — Dr. Murray Overington, Kingston FHN; Dr. Mark Wilkinson, Stratford FHN; and Dr. Richard Woodhouse, Parry Sound FHN — was especially appreciated, as they were instrumental in ensuring the successful completion of the project. Dr. John Dorland of Queen’s University advised on the key aspects of the costing analysis. Anne Marie Crustolo and Dr. Nicholas Kates of the Hamilton Mental Health and Nutrition Program kindly shared their clinical tracking and workload measurement tools so comparable data could be generated. Two undergraduate students in the Applied Human Nutrition program at the University of Guelph, Catherine Shea and Susan Tran, ensured accurate and timely data entry. Dr. Mary Thompson of the Survey Research Centre at the University of Waterloo reviewed the questionnaires. Stacey Curry Gunn of Flow Public Relations & Marketing, Guelph, ON, provided editorial assistance.



Table Of Contents

Summary	4
Introduction	5
Methods	5
Context – RD practice in each FHN.....	5
Overview of questionnaire and data collection form development.....	5
Overall data collection plan.....	6
Assessment of human resources needs.....	6
Calculation of direct costs.....	6
Calculation of indirect costs.....	7
Sensitivity analysis.....	7
Workload measurement.....	7
Results	7
Human resources estimates.....	7
Direct costs	8
Indirect costs.....	10
Sensitivity analysis.....	11
Workload measurement.....	13
Discussion	13
Human resources planning.....	14
Costing analysis.....	14
Relevance to Practice	15
Appendices	16
1 – Human Resources Planning.....	16
2 – Registered Dietitian Workload Assessment Appendix.....	17
3 – Receptionist Workload Making Appointments for the Registered Dietitian.....	20
4 – Registered Dietitian Communication Assessment.....	21
5 - Satisfaction with Addition of Registered Dietitian (Change in Routine Questionnaire).....	22
Tables	8
1 – Actual direct costs to the three Family Health Networks in the demonstration project.....	8
2 – Estimated direct costs for one Family Health Network with one full-time Registered Dietitian.....	8
3 – Average indirect costs for one full-time Registered Dietitian in a Family Health Network.....	10
4 – Estimated total direct and indirect costs for one Family Health Network with one full-time Registered Dietitian.....	11
5 – Change in Routine questionnaire results.....	12
Figure 1 – RD Workload Distribution, Average of 3 FHNs.....	13
References	24

Summary

Human resources planning guidelines and costing estimates for Registered Dietitian (RD) practices in interdisciplinary primary health care settings are currently based on very limited information. As part of an Ontario Primary Health Care Transition Fund demonstration project (September 2004 to March 2006), human resources planning and cost estimates were developed for RD services, based on data from three Ontario Family Health Networks (FHNs).

Human Resources

Two methods were used to estimate the need for RD services. Firstly, information on new referrals was collected by the RDs from January to December 2005. The patient roster numbers as of December 2005 were the denominators. The referral rate was 1.26 per cent of rostered patients. Secondly, all physicians were asked to complete a paper-based checklist that listed all patients seen in the past week, whether they had a contributing nutrition issue, and how the issue was managed. Twenty-seven of 41 physicians (66%) completed the physician management form. Of 1,884 patients reviewed, 17.5 per cent of patients were reported to have a contributing nutrition problem. Physicians reported that they discussed the nutrition issues with 12 per cent of all patients, and referred 25 patients to the FHN RD or 1.3 per cent of the patients reviewed. Another 20 patients (1.1 per cent) were referred to other services, such as Diabetes Education Centres in the community. Thus, 1.3 per cent to 2.4 per cent of patients required RD counselling in one year.

To complete the calculation, an estimate of the caseload that can be managed by the RD is needed. From this study, one full time equivalent RD (1 FTE RD = 1,950 hours) could manage 380 new referrals a year. Higher caseloads would be achieved with time and without the formal evaluation component of the demonstration project. Therefore, a reasonable estimate is 1 FTE RD per 15,800 to 29,000 patients [(380/0.024) to (380/0.013)] in the first year of practice.

Numerous other considerations would affect the actual requirements, such as the health and psychosocial characteristics of clients, the organization and number of practice sites in the FHNs, and the geographic nature of the practice and the existence of other services in the community, such as Diabetes Education Centres, etc. Current average physician referral patterns were the basis for the calculation. If enhanced chronic disease management were implemented or physicians increased their referral rates, then additional RD services may be required.

Costing

The RDs involved in the project were contracted to provide services and did not receive benefits. Direct costs were tabulated as incurred, except for fixed costs, which were estimated. Analysis of indirect costs focussed on the costs of RD communication with other providers in the FHN. FHN staff completed two questionnaires addressing communication and satisfaction with RD services over the course of the project, as part of a sensitivity analysis. The estimated direct costs of adding one FTE RD (including expenses and fixed costs) is \$78,169 to \$80,169, when the RD is an independent contractor.

Workload assessment

Workload assessment was also completed by the three RDs for two two-week periods during the project. Sixty per cent of their time was spent in individual counselling.

These preliminary estimates provide baseline information. Additional studies are needed to develop better estimates of human resources needs and costs of interdisciplinary RD services in all primary health care settings.



Introduction

Successful integration of Registered Dietitians (RDs) into primary health care (PHC) organizations will be achieved by creating feasible, effective services that meet the needs of health care providers and patients, at a price that the Canadian health care system can afford. When they are considering adding a RD to the team, service planners need information about the projected direct costs, including salary and expenses, as well as the indirect costs to the rest of the organization. Therefore, as part of an Ontario Primary Health Care Transition Fund demonstration project, preliminary human resources and cost estimates were developed, based on data collected when three RDs were placed in three Family Health Networks (FHNs).

FHNs are an Ontario model of primary health care with three or more physicians working with other selected health care professionals to provide PHC services to enrolled patients. They are funded in a blended funding model that includes capitation payments (population-based funding of health care services) with incentives for additional specific preventive health care activities. The physicians often work in separate offices. They have received support from government to implement electronic health records (EHRs). FHNs have not had RDs in the past.

Methods

Context – RD practice in each FHN

The steering committee reasoned that better estimates of average human resources needs and costs would be developed for planning purposes if geographically diverse FHNs were represented. In April 2004, a request for proposals was sent to all FHNs and primary health care models that met specific criteria, including five or more physicians, diverse locations in urban, rural and northern settings, development of EHRs already under way, and no previous RD services. The three FHNs (Parry Sound, Kingston and Stratford) were chosen in May 2004 from eight submissions. In July, Dietitians of Canada (DC) hired three experienced RDs as independent contractors to work at each of the sites. The RDs received orientation and training in August, and began working in FHN offices in September 2004 as directed by staff at each FHN. The RDs were contracted to work seven hours a day for three or four days a week, based on available project funding.

Each FHN organized its RD services differently. In one FHN with three separate offices, the RD was located in one office, had to arrange her own appointments, and hired a student to call patients for initial appointments. This RD booked all of her own follow-up appointments. In the second FHN with 13 offices, the RD had an office in one location, and a receptionist or nurse booked the appointments. In the third FHN of three offices, the RD provided nutrition counselling at each site on given days of the week, and initially a receptionist booked the nutrition appointments at two of the sites. (Halfway through the project, the RD was required to take over booking all initial and follow-up appointments.) This RD also did not have an office, and carried all her resources with her, including her computer and nutrition patient charts, to each site. All FHNs were in the process of implementing EHRs over the course of the project, but only one FHN had a fully functioning EHR system by project completion.

The RDs implemented a practice model that was broadly based on previous role documents (1,2), with a main focus on nutrition counselling and a secondary mandate to develop health promotion and disease prevention programming. Elements of “enhanced” practice were implemented (3,4). These included computerized diet record analysis, counselling process using the PRECEDE-PROCEED model (5), and assessment of blood pressure, waist circumference, and health-related quality of life (SF-36)(6-9), with a minimum of two client visits (a baseline assessment and three month follow-up). In addition, a portion of each baseline appointment was devoted to explaining a RD clinical evaluation study and to soliciting possible participation. Otherwise, the RD and her clients developed individualized plans, based on mutually agreed-upon goals. Work for the project was completed in March 2006.

Overview of questionnaire and data collection form development

All questionnaires and data collection forms were adapted from other sources. The RDs created their own forms to track, on a monthly basis, the number of initial, follow-up and cancelled appointments. The physicians’ management form (Appendix 1) and workload measurement categories (Appendix 2) were adapted

from the Hamilton Health Services Organization (HSO) Mental Health and Nutrition program instruments (Anne Marie Crustolo, personal communication 6 February 2004) (10) to ensure that comparable data would be collected. The detailed workload measurement form was adapted from previous methods, and employed 15-minute time categories (11). Forms for receptionist time spent making appointments for the RD (Appendix 3) and RD communication with other providers (Appendix 4) were developed for this project, based on forms used in previous economic analyses.

A Change in Routine questionnaire (Appendix 5) was developed to identify any major workflow disruptions that the RD may have caused FHN staff (12,13). Each staff member received a letter explaining the study, the questionnaire, and a pre-stamped envelope addressed to the University of Guelph. No identifying information was collected. The person responsible for administering the survey at each FHN sent an email reminder to the staff halfway through the data collection period.

All questionnaires and data collection forms were pilot tested or reviewed by the RDs, and reviewed by the lead physicians. A survey methodologist also reviewed all forms and questionnaires. In addition, 14 RDs from a primary health care advocacy group reviewed the Change in Routine questionnaire.

Overall data collection plan

The three RDs and the project coordinator collected information on costs, major time expenditure, and activities, including the number of patients referred over the entire project. Detailed workload measurement, receptionist time and questionnaires were collected twice for two-week periods in the spring and fall of 2005, in consultation with the FHNs. Methods and timing varied somewhat in each FHN.

Assessment of human resources needs

Mean number of physicians per one full-time equivalent dietitian: This method has been used in the past to develop an estimate of service needs (10). The number of physicians from all three FHNs was used as the basis for calculation, without regard to patient load.

Mean number of new referrals to a full-time equivalent dietitian: The calendar data on new referrals for January to December 2005 were used to calculate new referrals, defined as new persons referred for counselling for a new diagnosis. The patient roster as of December 2005 was the denominator. An “episode of care” was defined as a person referred to nutrition counselling for a specific problem, and who continued counselling for the same problem, irrespective of follow-up timing (14,15).

Physician report of referral activity for one week: All physicians were asked to complete a yes/no checklist that listed all patients seen in a one-week period by initials, age, sex, referral problem, whether they had a contributing nutrition issue, and how the case was managed. Management options were: a) provided nutrition/lifestyle counselling, b) referred to nurse, c) referred to RD, or d) referred to other and, if so, whom.

Calculation of direct costs

Direct costs are those that are directly incurred by having the RD in the FHN. They include the RDs’ compensation, the set-up costs (for example, purchasing weigh scales or food models), and the ongoing costs that the RD requires to operate (for example, telephone charges, paying a booking assistant). Direct costs were calculated from monthly data submitted to the project coordinator. Direct costs were tracked according to the category in which the money was spent. For the purposes of calculation, a full time equivalent (FTE) position was assumed to equal 1,950 hours of work per year.

Other direct costs could be incurred if the addition of the RD to the FHN created significant additional work for the FHN staff. This would need to be so significant that it would necessitate hiring additional staff. If that were the case, another direct cost would be the cost of hiring an additional person to work at the FHN to help with the extra work created by the RD. Whether this might be necessary was assessed by both the amount of receptionist time making appointments and the Change in Routine questionnaire.



Calculation of indirect costs

Indirect costs are costs that are not directly billable. For the purposes of this analysis, the major indirect cost considered was the cost of communication between the RDs and other providers. For example, when the RD needed to speak with a physician, she was incurring an indirect cost because the time that the physician took to talk with her was time taken from other work. Hence, the indirect cost of such interactions would be the physician's salary multiplied by the amount of time for the interaction.

To assess indirect costs, RDs completed a two-week form twice during the study. The RDs placed a check mark in the appropriate column for each interaction, noting with whom the interaction took place (e.g., physician, nurse, receptionist, etc.). The RDs also indicated the average amount of time for each interaction, and weekly interaction times were calculated from this data.

Sensitivity analysis

A major issue in adding a RD to the team was the potential impact on receptionist workload. As previously mentioned, one RD made her own appointments throughout the study, while receptionists in the other two FHNs made appointments at least part of the time. Receptionists making appointments for the RD were asked to track this activity for two two-week periods during the study, using a check-off form and estimating the average call as taking two minutes.

Another aspect that was considered in the sensitivity analysis was the possible effect of the RD on the work of other FHN staff, as reflected in the Change in Routine questionnaire.

Workload measurement

Detailed workload assessment was carried out for two-week periods twice during the project. The RD tracked work time in 15-minute blocks by checking the appropriate boxes for the activity codes. Additional categories of work time were added to the form used in this study to address health promotion activities, training, research and travel time between FHN sites during a workday.

All data were analyzed using either Microsoft Excel 2002 (Redmond, WA, Microsoft Corporation 2002) or SPSS 10.0 (SPSS Inc., Chicago, IL, 2000). All aspects of the study were approved by the Research Ethics Board at the University of Guelph.

Results

Only mean values are reported across the three FHNs, both to protect the identity of individuals and to develop estimates for planning purposes.

Human resources estimates

The RDs' paid hours ranged from 0.57 to 0.71 of a FTE, with an average of 1,306 hours per year or 0.67 FTE. Therefore, there were $0.67 \times 3 = 2.0$ FTE RDs working with 41 physicians. The ratio of RD:physicians was 1:20.5.

From January to December 2005, 757 referrals were made, according to a combined roster of 59,926 patients (as of December 2005), for an average referral rate of 1.26 per cent (range: 1.04% to 1.44%). Therefore, the 757 new referrals translated to 379 referrals per FTE RD.

This overall referral rate includes patients who were referred but did not book an appointment with the RD (10% of total referrals), as well as patients who booked an appointment but did not show for the appointment (10%). Of the 757 referrals, the RDs completed baseline interviews with 603 patients, or 302 patients per FTE RD per year.

Twenty-seven of 41 physicians (66%) completed the physician management form. Of 1,884 patients reviewed, 17.5 per cent were reported to have a contributing nutrition problem. Physicians reported that they

discussed the nutrition issues with 12 per cent of all patients and referred 25 patients, or 1.3 per cent of the patients reviewed, to the FHN RD. Another 20 (1.1%) patients were referred to other community services, such as Diabetes Education Centres.

Direct costs

Two sets of direct costs are shown in Tables 1 and 2. Table 1 shows the actual costs to the three FHNs involved in the project. Direct costs were based on the mean RD contracted rate of \$36.81/hour for the actual hours worked, plus actual expenses, adjusted to one year.

Table 1. Actual direct costs to the three Family Health Networks in the demonstration project

Compensation (3 RDs over 1 year)	\$144,276.79
Expenses (3 RDs over 1 year)	\$15,893.28
Total direct costs over 1 year (including expenses)	\$160,170.07
Total direct costs over 2 years, undiscounted (includes expenses)	\$320,340.14
NPV of total direct costs over 2 years, discounted at 5%	\$297,821.90

Expenses include membership fees, educational resources, supplies, printing, telephone, postage, courier, travel, meals, accommodation, conferences, additional help to book appointments and analyse food records, gifts and equipment rental. NPV is the net present value of the income stream, in this case over two years.

RD = Registered Dietitian

Table 2 shows the projected costs of adding a FTE RD to one FHN, excluding project specific expenses. One FTE RD costs \$36.81 multiplied by 1,950 hours per year for an annual cost of \$71,779.50, plus expenses. For a RD in a salaried position, vacation pay, health benefits, or remuneration in lieu of benefits might need to be considered. The RD might also negotiate other benefits, such as employer-paid continuing education expenses.

Table 2. Estimated direct costs for one Family Health Network with one full-time Registered Dietitian

Compensation	\$71,779.50
Expenses (including initial fixed costs, over 1 year)	\$7,389.75 (Range: \$6,389.75 – \$8,389.75)
Expenses (excluding initial fixed costs, over 1 year)	\$4,389.75
Total direct costs (including expenses and fixed costs)	\$79,169.25 (Range: \$78,169.25 – \$80,169.25)
Total direct costs over 2 years, undiscounted	\$155,338.50 (Range: \$154,338.50 – \$156,338.50)
NPV of total direct costs over 2 years, discounted at 5%	\$144,487.04 (Range: \$143,534.66 – \$145,439.42)

Expenses exclude those related to the project only but do include membership fees, educational resources, supplies, printing, telephone, conferences, additional help to book appointments and analyse food records, gifts and equipment rental. Fixed costs include an estimation of the cost of computer equipment and office furniture (\$3,000, range: \$2,000 – \$4,000).

NPV is the net present value of the income stream, in this case over two years.



The actual expenses from the submitted expense records included membership fees, educational resources, supplies, printing, telephone, postage, courier, travel, meals, accommodation, conference costs and help to do bookings and analyze diet records. RD expenses over one year were calculated as follows: because data were available for a total of 19 months, all categories were summed and adjusted to one year (Table 1). Postage and courier fees to send data to the University of Guelph, travel costs, meals, and accommodation were project expenses removed from the expense calculations in Table 2.

Fixed costs were included in the estimated direct costs to one FHN with one full-time RD only in Table 2, and not in the calculation of the actual costs to the three FHNs in Table 1 because the FHNs did not incur these costs. For this demonstration project, the RDs were able to provide their own computers, which would not be expected if they were hired full-time into the FHN. Fixed costs in Table 2 would have included mostly set-up costs, such as the cost of a desk, office chairs and a computer for the RD; however, because they were not incurred in the demonstration project, these fixed costs were estimated. The range of fixed costs used was \$2,000 to \$4,000 for furniture and a computer. The ranges are indicated as lower and upper bounds of the direct costs, and the middle value of \$3,000 was used in the cost calculation. The range reflected the wide variability in price of these items, and allowed for the possibility that the FHN may already have owned some of these items (e.g., office furniture), and would not need to purchase them. One potential cost not incorporated into this calculation is the possible need to rent extra space for the RD. The basic requirement for a RD would be an office large enough to seat three people comfortably for consultations.

The project was 19 months long and the costs were projected to two years. This was done for two reasons: first, to be able to show the difference in net present value (NPV) of costs versus undiscounted costs, and second to be able to compare this with two years of cost projections for adding a RD to one FHN. Fixed costs, although not very large compared with other costs, are nonetheless incurred only in the first year. Costs are discounted at the end of the year, since salaries and expenses are paid throughout the year, not wholly at the beginning. The 5 per cent discount rate is commonly used, and undiscounted costs over the same period were also calculated so that these totals reflect the range of using a discount rate between zero and 5 per cent.

Indirect costs

In the indirect cost computation, the term “others” refers to the FHN administrator, other RDs, pharmacy staff, office staff (including nurses, receptionists and administration staff), and sales representatives. Because the salaries of this mix of people vary substantially, the average salary for all occupations was used.

Table 3 shows the indirect project costs. The salaries used to calculate the value of time are listed below the table. The weekly averages of interactions are based on four weeks of data collection: two weeks in March 2005, and two weeks in October 2005.

Table 3. Average indirect costs for one full-time Registered Dietitian in a Family Health Network

	Minutes of Interactions (weekly average)	Value of time
With physicians	80.00	\$66.49
With nurses	25.00	\$9.73
With nurse practitioners	23.75	\$13.93
With pharmacists	20.00	\$10.80
With receptionists	126.00	\$27.17
With others	152.50	\$57.72
Total indirect costs (weekly)		\$185.85
Total indirect costs per year		\$9,664.05
Total indirect costs over 2 years, undiscounted		\$19,328.10
NPV of total indirect costs over 2 years, discounted at 5%		\$17,969.44

NPV is the net present value of the income stream.

Hourly wages are based on the average annual salary of full-time workers (40 hours/week, 52 weeks) for that profession in Ontario in 2000 (Statistics Canada, Earnings of Canadians), except salary for nurse practitioners, which is based on the average salary advertised in job ads posted by the Registered Nursing Association of Ontario (www.rnao.org). Annual salary of general practitioners is \$103,731, and hourly wages \$49.87; annual salary of nurses (assuming they are registered) is \$48,564, and hourly wages \$23.35; annual salary of nurse practitioners is \$73,200, and hourly wages \$35.19; annual salary of pharmacists is \$67,399, and hourly wages \$32.40; annual salary of receptionists is \$26,904, and hourly wages \$12.94; and annual salary of others was taken as the average salary of all occupations, \$47,232, and hourly wages of \$22.71.



The final calculations are the total costs to one FHN with one full-time RD (Table 4). These include direct and indirect costs.

Table 4. Estimated total direct and indirect costs for one Family Health Network with one full-time Registered Dietitian

Total direct costs per year (including fixed costs)	\$79,169.25 (Range: \$78,169.25 – \$80,169.25)
Total indirect costs per year	\$9,664.05
Total costs per year (1 st year, including fixed costs)	\$88,833.30 (Range: \$87,833.30 – \$89,833.30)
Total costs over 2 years, undiscounted	\$174,666.60 (Range: \$173,666.60 – \$175,666.60)
NPV of total costs over 2 years, discounted at 5%	\$162,456.48 (Range: \$161,504.09 – \$163,408.86)

NPV is the net present value of the income stream.

Expenses include: membership fees, educational resources, supplies, printing, telephone, conferences, hired help, gifts and equipment rental. Fixed costs include an estimation of the cost of computer equipment and office furniture (\$3,000, range: \$2,000 – \$4,000). Indirect costs are those calculated in Table 3.

Sensitivity analysis

The receptionist workload was calculated to assess how many direct patient contacts related to the RD were made in each FHN. The average number of phone calls per week for the first set of data (collected around April 2005) ranged from 11 to 51.5. For the second set of data (collected around November 2005), the range was 10.5 to 41.5 phone calls per week per FHN. An increase in the number of calls per week was seen in Stratford (from 20 to 25), while Parry Sound and Kingston both saw fewer calls during the second collection period (from 51.5 to 41.5 and from 11 to 10.5, respectively). If each phone call took two minutes (as was assumed), then 51.5 calls per week takes up 4.3 per cent of the receptionist’s time.

The number of appointments made with the RD and the number cancelled were also recorded. Not much variation occurred between the two data collection periods in the number of appointments kept (i.e., appointments made minus appointments cancelled). The range was two to 16 appointments over the two-week data collection period in April 2005, and five to 16 appointments for two weeks in November 2005. However, the number of appointments cancelled was reduced; zero to 14 were cancelled in the first period, and one to nine in the second period. The Change in Routine questionnaire did not indicate that taking calls for the RD disrupted the receptionist’s work, and the time demands (4.3%) were small.

The Change in Routine questionnaire provides additional insight into the value of adding a RD to a practice. The response rate was 42 per cent (47/111) for the first administration of the questionnaire, and 56 per cent (63/112) for the second administration. Cronbach’s alpha was used to measure the intercorrelation among the items in this ordinal-scale survey; it is a coefficient of internal consistency. Cronbach’s alpha was 0.88 for the eight five-level questions for the survey conducted in spring 2005; it was 0.82 for the survey conducted in fall 2005. Both are considered acceptable.

The data for the two administrations were kept separate to make possible the identification of any adjustments that the FHN staff may have made to the presence of the RD (Table 5). Evidence of such adjustment was seen by the second questionnaire administration.

Table 5. Change in Routine questionnaire results

	Spring 2005 n=47		Fall 2005 n=63	
	% who agree or strongly agree	Median (Range)	% who agree or strongly agree	Median (Range)
General Environment for Change				
1. The nature of my job makes structural changes easy to accommodate.	46	3 (2 – 5)	64	4 (1 – 5)
2. The climate for change is very supportive and positive in our FHN.	66	4 (2 – 5)	86 ¹	4 (2 – 5)
Attitudes and Opinions about Addition of the Dietitian				
3. Information about how the new RD would fit into our FHN was well communicated.	49	3 (2 – 4)	67 ¹	4 (1 – 5)
4. I was well prepared for my role with respect to the RD.	51	4 (1 – 4)	73 ¹	4 (1 – 5)
5. Have your duties increased as a result of the addition of the RD? (Yes/No)	33 reporting change	N/A	22 reporting change	N/A
5b. I did not have problems fitting the extra work that I do for the RD into my regular workload.	38 (6/16)	3 (2 – 4)	80 ¹ (24/30)	4 (1 – 5)
6. Having an RD in our FHN has increased my job satisfaction.	43	3 (1 – 5)	65 ¹	4 (1 – 5)
7. I feel that I can express my concerns about the new RD.	68	4 (2 – 5)	89 ¹	4 (2 – 5)
8. I feel that these concerns would be taken seriously.	62	4 (1 – 5)	84 ¹	4 (1 – 5)
Overall Attitude to Addition of the Dietitian				
9. My overall attitude towards the addition of the RD in our FHN is: 1= Dissatisfied to 4 = Satisfied Percentage satisfied	65	4 (2 – 4)	86 ¹	4 (1 – 4)

¹ Percentage who agree or strongly agree on a five-point Likert scale, unless otherwise indicated; median and range

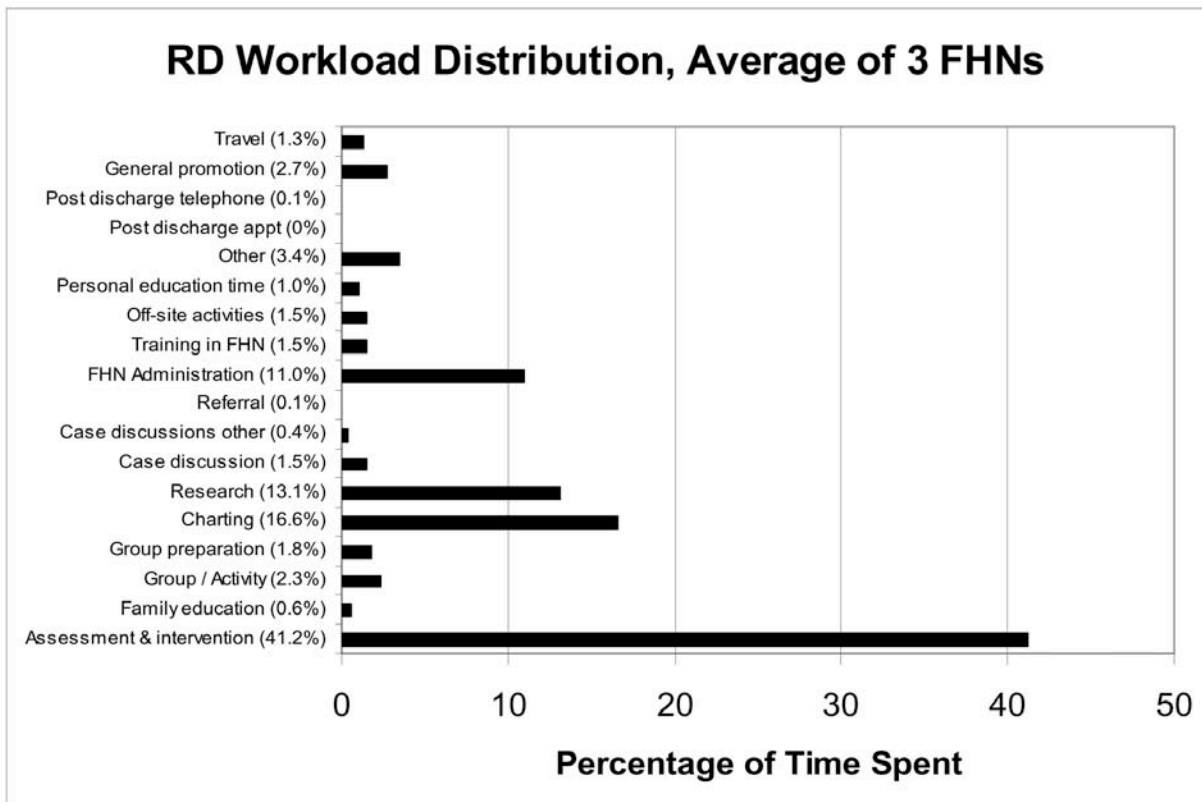
² p<0.05 Pearson chi-square for the hypothesis that the proportion agreeing and survey administration are independent
FHN = Family Health Network; RD = Registered Dietitian; n/a = not available



Workload measurement

Finally, the output for the average workload distribution for each RD at three FHNs in two time periods is illustrated in Figure 1.

Figure 1. Registered Dietitian workload, averaged over the three Family Health Networks



Discussion

Currently, human resources planning guidelines and costing estimates for RDs in PHC settings are based on very limited information. Estimates developed in this study are preliminary, as they depend on information from only three FHNs gathered during a demonstration project. The analysis was for an enhanced RD model of counselling and health promotion nutrition services for the first year.

We expect these estimates will differ from others elsewhere for several reasons. Community health centres in Ontario serve the needs of special or high-risk populations, who typically require more intensive and diverse services, such as those to promote community development (16,17). Estimates developed by private practice dietitians must include the costs of running a completely independent business (17). Estimates developed for organizations, such as ambulatory care clinics within hospitals, or regional services such as the Hamilton HSO Mental Health and Nutrition Program (10), will also differ because coordinating and evaluation functions are typically centralized.

Human resources planning

Referral rate estimates are based on reported case management over one week and actual referrals over one year. They were very similar, about 1.3 per cent of FHN patients. An additional 1.1 per cent were referred to other community programs, according to the physician case management survey. Availability of nutrition programs varies substantially in communities, so 1.3 per cent to 2.4 per cent of patients may be referred for counselling within the FHN.

To calculate RD services, an estimate of the caseload that the RD can manage is needed. The number of patients seen by one FTE RD in this project was 379, which is lower than the number reported by the Hamilton HSO Mental Health and Nutrition Program, in which one FTE RD sees 710 referrals per year (10). A number of possible reasons may explain these differences. One factor may have been the time required to set up new services, determine patient needs, and establish relationships with colleagues in the FHNs and other agencies. Another important difference was that this demonstration project included a RD evaluation component, which could not be separated from assessment and counselling in the workload analysis, as it was embedded within appointments; in addition, 13 per cent of time was strictly devoted to research activity. The definition of an “episode of care” also may have differed between the programs. Such differences could significantly impact perceived efficiency. Overall, management of 380 new referrals a year is a realistic estimate of the number of patients that one FTE RD could manage in the first year of practice.

If 1.3 per cent to 2.4 per cent of patients require individual counselling in a year, and a full time RD sees 380 new referrals a year, a reasonable first estimate is that a FHN would need one FTE RD per 15,800 to 29,000 patients ($[380/0.024]$ to $[380/0.013]$) for an interdisciplinary model of nutrition services.

As a check on the estimates developed in this analysis, the Hamilton data were used to estimate the roster that one FTE RD could manage. The demonstration project data revealed that the average physician had $59,926/41 = 1,462$ or approximately 1,500 patients. The Hamilton HSO Mental Health and Nutrition Program reported six FTE RDs provided services to 80 physicians (excluding administration and evaluation), a ratio of one RD to 13.3 physicians (10). When this number and the estimate of 1,500 patients per physician are used, one FTE RD could provide services to an enrolled population of approximately 20,000 ($13.3 \times 1,500$), an estimate that falls within the same range as the estimates developed in this project.

Numerous factors, including availability of other nutrition services in the community, will affect the actual requirements. Patients’ ages, gender, health and psychosocial characteristics, the organization of and number of practice sites in the FHN, and the geographic location may all have an impact. In addition, individual physician referral rates may vary significantly, as was found in this study.

Despite the limitations, this and other population-based methods for estimating RD needs will, over time, yield superior estimates to those based on provider ratios, such as RD to physician ratios. Such ratios become increasingly problematic as the interdisciplinary team expands and new ways of organizing services develop.

Costing analysis

Direct costs of adding a FTE RD (including expenses and fixed costs) were calculated assuming the RD was an independent contractor. However, if the RD were salaried, vacation pay and other benefits might have to be considered. The largest component of direct costs was the RD’s salary (approximately 80%); expenses contributed the rest.

Indirect costs of adding a RD to a FHN were incurred in this project [\$9,664.05 (Table 3)]. The communication documented in this study is an integral feature of interdisciplinary practice, however, and the significance of these costs is uncertain. Such indirect costs are significant if the opportunity cost truly is time spent working that is not made up in regular office hours. For example, the indirect cost that the RD incurs for physician contact is problematic if those 80 minutes per week are preventing the physician from continuing to see patients or to work at the same rate as before the RD came into the FHN. The Change in Routine questionnaire results did not indicate that the presence of the RD prevented other FHN members from continuing to work at the same pace, but data by professional designation were not collected (Table 5).

One limitation of the costing analysis is the inability to compare the cost estimates with the costs that



would be saved by having a RD available to patients who need one, or with the advantages of having direct communication between the RD and the other people involved in a patient's care. The indirect cost savings of having a RD in a FHN are diverse and would include travel time saved by patients, the convenience of being able to make a RD appointment at the FHN, and improved chronic disease management through improved communication among providers. Indirect cost savings were not assessed. Further study of the indirect costs and savings of communication in interdisciplinary practice is needed.

Relevance to Practice

The advantages of having RDs in PHC settings, especially for disease prevention and chronic disease management, are not easily calculated at this point. This is mostly because the advantages are long-term health benefits to patients. Diet treatment is integral to practice guidelines for management of diabetes, hypertension and dyslipidemia, but effectiveness in obesity treatment remains problematic (4). Chronic diseases are a large burden on the Canadian health care system, however, and reducing their incidence or severity would provide substantial benefits to the system. For example, the annual cost of obesity in Canada was estimated between \$1.8 billion (1997) (18) and \$2.1 billion (1999) (19). Indirect costs could be as high as \$3.7 billion (2001) (20). Given the potential long-term health benefits (4), and the positive response to having RDs in the demonstration sites, the addition of a RD to the interdisciplinary team in FHNs and similar primary health care organizations seems to be a worthwhile investment.

The results of this study provide some direction to groups planning to add RD services to their family physician-based primary health care practices. The study addresses a gap in the literature on human resources planning for RD services. Additional studies are now needed to improve this estimate by basing calculations on a wider range of PHC organizations, on a longer time frame, and on diverse populations; in addition, effectiveness must be linked to resources. While direct costs of services are commonly estimated, receptionist and clerical costs are often not included and should be. Information on the indirect costs of communication and coordination for RD services has also been lacking. Published information on both direct and indirect costs for all models of nutrition services in primary health care settings is needed to improve on the estimates developed in this study.

Appendices

Appendix 1 – Human Resources Planning

Note: The following form was developed for paper-based analysis of physician management of nutrition issues. If electronic scheduling and/or health records are available, then analysis of the same information may be possible through review of these records.

Instructions for Completing the Physician Management Form

Purpose

- To estimate the percentages of your patients with different characteristics (age and sex) who:
 - o Have nutrition issues
 - o AND of the patients with nutrition issues, how you managed them

Following are listed the initials, age and sex of all patients you saw last week. Please complete the table by checking how the patient was managed regarding the nutrition issue.

	Patient Initials	Age	Sex	Contributing Nutrition problem √ = Yes Blank = No	You provided nutrition/ lifestyle counseling √ = Yes Blank = No	You referred to RD √ = Yes Blank = No	You referred to nurse √ = Yes Blank = No	You referred to other √ = Yes (if yes, whom) Blank = No
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								



Appendix 2 – Registered Dietitian Workload Assessment

MAJOR ACTIVITY CODE DESCRIPTION FOR DIETITIAN WORKLOAD MEASUREMENT

CODE	BRIEF DESCRIPTION	DESCRIPTION
01 Clinical or individual health promotion	Assessment & Intervention	<p>This code includes all direct client service. The individual client is present. This includes: nutrition screening nutrition assessment</p> <p>The purpose of the assessment is to clarify and answer questions(s) which prompted the referral. This includes time spent on direct client services such as formulating a plan, monitoring, adjusting the plan, patient education and discharge planning. The client is present (exception is therapeutic contact by telephone with patient or family).</p>
02 Clinical or individual health promotion	Family Education	<p>The code includes all direct clinical time in which the RD is with a patient's family involved in patient teaching. Patient may or may not be present. This is additional to time under Code 01</p> <p>This includes: nutritional education, discharge planning</p>
03 Clinical or group health promotion	Group / Activity	<p>Includes all direct contact time spent facilitating or co-facilitating group/activity for clinical conditions or for health promotion, e.g. Weight loss group, healthy eating, etc.</p> <p>Use of this code for facilitating or co-facilitating a group requires a list of all nutrition referral numbers for participants.</p>
04 Other Clinical or group health promotion	Group / Activity Preparation	Includes all time spent preparing for group activity.
05 Other Clinical	Chart Review Clinical Charting Progress Notes	This code is used to represent time utilized to review / read patient charts and time used to write notes in practice charts related to nutrition screening, nutrition assessment, care plan formulation and intervention.
06 Administration	Program Evaluation Forms	Time utilized to complete Nutrition Services Forms. Weekly teleconference.
07 Other Clinical or health promotion	Case Discussion/ Verbal Update with MD and/or Primary Care Team Members	Time is spent in review or discussion with regard to some aspect of individual patient's care or providing general information / education to the family physician and/or care team. Discussion is usually with the Family Physician, or another health care team provider in the practice to facilitate treatment planning, on-going management and/or education. This code would be used to record time spent in order to triage cases.

CODE	BRIEF DESCRIPTION	DESCRIPTION
08 Other Clinical or individual health promotion	Case Discussion with Other	Discussion with another health care provider outside of the primary care setting to facilitate treatment planning or ongoing management. Specify.
09 Other Clinical or individual health promotion	Referral to/ Clinical Discussion with Another Service	Any contact with Community Agency(s) to facilitate treatment plans or ongoing management of patient through sharing of information. This includes a referral of patient to any community treatment service in which written and/or verbal communication with the service intake worker takes place.
10 Admin.	FHN Administration Activities	Includes time spent in organizational staff meetings, administrative phone contact, patient appointments (non-therapeutic calls), filing, photocopying, correspondence, letters, and referrals.
11	Training in FHNs for interdisciplinary nutrition services	RD training and sharing with other staff and physicians to improve coordination of nutrition services within the FHN
12 Admin.	Off-site Activities	Includes time spent in off-site meetings, other activities away from the practice. Please specify.
13 Education	Personal Education Time	Includes all <u>time invoiced</u> for personal education such as reading, attending conferences and workshops approved by the Project Coordinator. Please specify.
14	Other	Please specify.
15 Clinical	Post Discharge Appointment	After a case has been closed, this code can be used for direct clinical follow-up of a presenting problem as addressed during the most recent episode of care. The patient must be present (use Code 14b for telephone contact). New presenting problems require a new referral to be completed by the family physician.
16 Clinical	Post Discharge Telephone Appointment	After a case has been closed, this code is for telephone follow-up of a presenting problem as addressed during the most recent episode of care. (Use Code 14a if patient is present). New presenting problems require a new referral to be completed by the family physician.
17 Practice Based Health Promotion	Generic health promotion	All activities related to generic health promotion activities. Please specify. This code includes time spent on developing, organizing practice based health promotion activities, e.g. pamphlets, posters, events, community committee meeting, interaction with other agencies, coordination with other agencies, evaluating activities and writing reports, letters, etc.



CODE	BRIEF DESCRIPTION	DESCRIPTION
18	Travel	Travel time between FHN sites in the course of a work day, any travel during the work day to meetings, etc for health promotion, etc. Does not include travel to and from work at beginning and end of day.
19	Research activities	Time spent on this study that would not be included in any or the other activities

The RD used the above descriptions to code her time in 15 minutes blocks on this form.

DIETITIAN DETAILED WORKLOAD MEASUREMENT TOOL

Code	Description	Time of Day																			
		e.g. 0800 h	0900 h	1000 h																	
01	Assessment & Intervention																				
02	Family Education																				
03	Group / Activity																				
04	Group Preparation																				
05	Charting																				
06	Admin and Teleconference																				
07	Case Discussion																				
08	Case Discussion Other																				
09	Referral																				
10	FHN Admin																				
11	Training in FHN																				
12	Off-site Activities																				
13	Personal Ed Time																				
14	Other																				
15	Post Discharge Appt																				
16	Post Discharge Telephone																				
17	General Promotion																				
18	Travel																				
19	Research Activities																				

Appendix 3 – Receptionist Workload Making Appointments for the Registered Dietitian

RECEPTIONIST WORKLOAD

Period: _____

FHN: _____

Name _____

Please place one tick mark per phone call on the corresponding day in the table below.

WEEK 1

Monday	Tuesday	Wednesday	Thursday	Friday

WEEK 2

Monday	Tuesday	Wednesday	Thursday	Friday

Please place one tick mark below per RD appointment made through you, and one check mark per RD appointment that was cancelled through you.

Appointments Made	Appointments Cancelled



Appendix 4 – Registered Dietitian Communication Assessment

DIETITIAN INTERACTIONS FORM

Period: _____

FHN: _____

RD: _____

Complete this detailed sheet on personal interactions within the practice. Interaction is defined as any communication with another health professional in person, by email, FAX or phone. Writing in the medical record does not count. Please place one tick mark into the appropriate box for every interaction that occurred between you and the corresponding person:

With the Physician(s)	With the Receptionist	With the Nurse Practitioner(s)	With the Nurse(s)	With the Pharmacist(s)	Others

In the next box, please enter approximately the amount of time that interactions with each of the above people took, on average (i.e. enter one time that best indicates the average interaction time with each person):

With the Physician(s)	With the Receptionist	With the Nurse Practitioner(s)	With the Nurse(s)	With the Pharmacist(s)	Others

Appendix 5 - Satisfaction with Addition of Registered Dietitian (Change in Routine Questionnaire)

CHANGE IN ROUTINE QUESTIONNAIRE

Please answer the following questions about the addition of the Registered Dietitian (RD), and how it has affected your daily routine. Please use the scale below the question and check the box that best fits your answer. At the end of the survey, please complete the write-in comment section, if you wish.

1. Information about how the new RD would fit into our FHN was well communicated.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

2. I was well prepared for my role with respect to the RD.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

3.a. Have your duties increased as a result of the addition of the RD? If No, go to 4.

- | | |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| [1] | [0] |

3.b. I did not have problems fitting the extra work that I do for the RD into my regular workload.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

4. Having an RD in our FHN has increased my job satisfaction.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

5. The nature of my job makes structural changes easy to accommodate.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |



6. The climate for change is very supportive and positive in our FHN.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

7. I feel that I can express my concerns about the new RD.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

8. I feel that these concerns would be taken seriously.

- | | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
| [1] | [2] | [3] | [4] | [5] |

9. My overall attitude towards the addition of the RD in our FHN is:

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Dissatisfied | Somewhat Dissatisfied | Somewhat Satisfied | Satisfied |
| [1] | [2] | [3] | [4] |

Comments:

References

1. Community Dietitians in Health Centres Network. Community Dietitians - Trusted Food and Nutrition Experts. Toronto: Dietitians of Canada; 2004 [cited 1-3-2006]. Available from: http://www.dietitians.ca/pdf/CDHC_role_paper_March2004.pdf.
2. Dietitians of Canada. The Role of the Registered Dietitian in Primary Health Care: A National Perspective. Toronto: Dietitians of Canada; 2001 [cited 1-3-2006]. Available from: www.dietitians.ca.
3. American Dietetic Association. Evidence-Based Guides for Practice. Chicago: American Dietetic Association; 2002 [cited 1-3-2006]. Available from: www.knowledgeline.com/adaprotocols1/.
4. Ciliska D, Thomas H, Catallo C, Gauld M, Kingston D, Cantwell B, Freeborn C, Stevens R, Gesgjorskyj T, Jahn P. The effectiveness of nutrition interventions for prevention and treatment of chronic disease in primary care settings: a systematic literature review. Toronto: Dietitians of Canada; 2006 Available from: www.dietitians.ca.
5. Green LW. What can we generalize from research on patient education and clinical health promotion to physician counseling on diet? *Eur J Clin Nutr* 1999;53 Suppl 2:S9-18.
6. Ware JE, Donald Sherbourne C. The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care* 1992;30:473-83.
7. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 Health Survey manual and interpretation guide. Boston, Massachusetts: The Health Institute, New England Medical Centre, 1993.
8. Ware JE, Kosinski M, Keller SD. SF-36 physical and mental health summary scales: a user's manual. Boston, Massachusetts: The Health Institute, New England Medical Centre, 1994.
9. Ware JE, Kosinski M, Bayliss MS, McHorney CA, Rogers WH, Raczek A. Comparison methods for the scoring and statistical analysis of the SF-36 health profile and summary measures: summary of results from the medical outcomes study. *Medical Care* 1995;33:AS264-AS279.
10. Crustolo AM, Kates N, Ackerman S, Schamehorn S. Integrating nutrition services into primary care experience in Hamilton, Ont . *Canadian Family Physician* 2005;51:1647-53.
11. Standards for Management Information Systems in Canadian Health Service Organizations (MIS Standards). Ottawa: Canadian Institute for Health Information; 17-5-2006 [cited 11-7-2006]. Available from: http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=mis_e.
12. Performance Management - Goddard Supervisor Evaluation Survey. NASA's Goddard Space Flight Center Office of Human Capital Management; 2005 [cited 16-3-2006]. Available from: <http://ohcm.gsfc.nasa.gov/home.htm>.
13. Day M. Step by Step Guide to Employee Satisfaction Surveys. SearchWarp.com; 18-10-2005 [cited 16-3-2006]. Available from: <http://searchwarp.com/swa21348.htm>.
14. Lamberts H, Hofmans-Okkes I. The core of computer based patient records in family practice: episodes of care classified with ICPC. *Int J Biomed Comput* 1996;42:35-41.



15. Lamberts H, Hofmans-Okkes I. Episode of care: a core concept in family practice. *J Fam Pract* 1996;42:161-9.
16. Davidson B, Dietrich L, Brauer P. Key Informant Interviews: Dietitian Services in Current Programs 2005. Toronto: Dietitians of Canada; 2006 Available from: www.dietitians.ca.
17. Davison K, Mor A, Charlebois H. What are entrepreneurial dietitians charging? The consulting Dietitians Network National Fee Survey. *Can J Diet Prac Res* 2004;65:186-90.
18. Birmingham CL, Muller JL, Palepu A, Spinelli JJ, Anis AH. The cost of obesity in Canada. *CMAJ* 1999;160:483-8.
19. Katzmarzyk PT, Gledhill N, Shephard RJ. The economic burden of physical inactivity in Canada. *CMAJ* 2000;163:1435-40.
20. Katzmarzyk PT, Janssen I. The economic costs associated with physical inactivity and obesity in Canada: an update. *Can J Appl Physiol* 2004;29:90-115.