ABSTRACT

Among seniors, food choice and related activities are affected by health status, biological changes wrought by aging and functional abilities, which are mediated in the larger arena by familial, social and economic factors. Determinants of healthy eating stem from individual and collective factors. Individual components include age, sex, education, physiological and health issues, psychological attributes, lifestyle practices, and knowledge, attitudes, beliefs and behaviours, in addition to other universal dietary determinants such as income, social status and culture. Collective determinants of healthy eating, such as accessible food labels, an appropriate food shopping environment, the marketing of the “healthy eating” message, adequate social support and provision of effective, community-based meal delivery services have the potential to mediate dietary habits and thus foster healthy eating. However, there is a startling paucity of research in this area, and this is particularly so in Canada. Using search and inclusion criteria and key search strings to guide the research, this article outlines the state of knowledge and research gaps in the area of determinants of healthy eating among Canadian seniors. In conclusion, dietary self-management persists in well, independent seniors without financial constraints, whatever their living arrangements, whereas nutritional risk is high among those in poor health and lacking in resources. Further study is necessary to clarify contributors to healthy eating in order to permit the development and evaluation of programs and services designed to encourage and facilitate healthy eating in older Canadians.

MeSH terms: Elderly; nutrition; determinants; eating habits; healthy eating
founding factors, such as the cohort or period effect and selective mortality, cannot be clearly separated from the aging effect per se, particularly in cross-sectional studies. The few nutritional surveys of free-living elderly subjects with functional disabilities or in poor health suggest dietary intakes leading to insufficient levels of energy, protein and most micronutrients.

This paper was written to outline the state of knowledge and research gaps in the area of determinants of healthy eating among Canadian seniors.

**METHODS AND LITERATURE SEARCH**

Search and inclusion criteria and key search strings were established and used to guide the research. Published literature from 1990 to 2003 was examined as well as several older, classic sources. The search strategy targeted sources of information on the determinants of healthy eating among seniors, using web-based search engines such as MEDLINE, Ageline, PsycINFO and others, along with position papers and websites of numerous national and international governmental, public health- and nutrition-oriented organizations, as well as electronic newsletters. Search tools available through universal web browsers such as Google and Alta Vista were also used, and the relevant “grey literature” was accessed through a bilingual (French, English) catalogue developed by the Bibliothèque de gériatrie et de gérontologie of the Institut universitaire de géiatrie de Montréal. Key words included healthy eating in seniors, determinants of diet in elderly, factors influencing diet in elderly, determinants of nutrition status in elderly, determinants of food choice (intake/consumption/habits/practices) in older people, nutritional health promotion in the elderly, and targeted specific issues, such as social support and healthy eating.

Peer-reviewed scientific journals were the main sources of publications of recent research, and the proceedings of scientific conferences were also used to keep track of ongoing research in Canada, the US and internationally. Specific searches were carried out to locate and access research conducted by Canadian researchers, and an attempt was made to query gerontological nutritionists on their work. Studies were included in the review if they met the following criteria: study subjects were 65+ years of age, the dependent variable was “healthy eating”, or the study was cross-sectional or longitudinal. Studies were excluded from the review if the language of publication was other than English or French, or the methodology was not described or was unreliable. Decisions on the relevance of the material were made by both authors on the basis of the abstracts and, where necessary, the complete articles. Papers reporting on very specific population subgroups were discussed and put into context at the discretion of the authors.

**Determinants of healthy eating in older people**

**Individual Determinants of Healthy Eating**

Individual components motivating dietary practices include age, sex, education, other socio-economic factors, physiological and health issues, psychological attributes, lifestyle practices, and knowledge, attitudes, beliefs and behaviours. As people age, these factors often lead to alterations in food selection and decreases in food intake. Such modifications may be mediated by marital status, smoking, health status and physical activity level, physiological and functional attributes, and diverse biological changes wrought by aging, in addition to universal dietary determinants such as sex, education, income, social status and culture. While higher education and income levels are frequently strongly associated with better nutrition, disease prevention knowledge and behaviour in US, European and Canadian studies, this is not a universal finding.

These conflicting results may reflect not only the great heterogeneity in older populations but also the impact of confounding factors. For instance, food access is more difficult and health problems are more frequent in disadvantaged elderly subjects. This controversy is further highlighted when comparing cross-sectional and longitudinal survey findings. Indeed, over a six-year period, age emerged as a positive predictor of diet quality, particularly among women.

Food intake and appetite can also be negatively influenced by impaired visual and olfactory stimuli. Many drugs can also alter taste. A decline in salivary flow and masticatory impairment due to poor dentition (loss of teeth, inadequate dental and gingival care) contribute to insufficient mechanical crushing and initial enzymatic digestion in the mouth. These processes, along with mechanisms governing satiation and energy metabolism, have been shown to be disrupted in older adults, leading to the development of a physiological “anorexia of aging”.

Loneliness can contribute to inadequate nutrient intakes. Indeed, it has been shown that simply having the Meals-on-Wheels delivery volunteer stay with the meal recipient can improve dietary intakes. Food and nutrient intakes may be better among those with high nutrition and health awareness and poorer among those with a negative self-perception of physical health. In secondary analyses of dietary data collected from Quebecers aged 65 to 74 years, regression analyses showed that the strongest correlates of diet quality were the degree of attention paid to keeping a healthy diet, along with higher education, being a city-dweller, being a non-smoker and regular exercise. The issue of supplement use is also of interest in older individuals, as this may signal a healthier lifestyle and higher nutrient intake or, on the other hand, provide evidence that supplements are used to compensate for a poor diet. Finally, alcohol intake in seniors tends to be moderate and light to moderate drinking is associated with a better nutrient profile in older people.

**Collective Determinants of Healthy Eating**

Food choice in seniors is motivated by individual attributes that are mediated in the larger arena by familial, social and economic factors. In older people, collective determinants of healthy eating, such as accessible food labels, an appropriate food shopping environment, the marketing of the “healthy eating” message, adequate social support and provision of effective community-based meal delivery services, have the potential to mediate dietary habits and thus foster healthy eating. However, there is a startling paucity of research in this area, and this is particularly evident in Canada.
In community-dwelling elders, the relation between dietary quality, social support and living arrangements is controversial. Some studies have found positive relations,\textsuperscript{1,6,7,8,9,10,11} whereas others have found diet quality to be unaffected by a poor social network.\textsuperscript{12} It has been suggested that geographical isolation has an adverse effect on nutritional status among the elderly.\textsuperscript{13} For instance, an urban-rural difference in meal structure was observed in Poland,\textsuperscript{14} with lower consumption of certain food groups (meat, fish and eggs, fruit and their products, and fats and oils) in rural-dwelling seniors. It was suggested that food distribution systems and decreased buying power among rural inhabitants profoundly affect food habits. In contrast, other comparative studies of urban and rural-dwelling seniors in the US\textsuperscript{15,16} showed that nutrient intakes were inconclusive and may depend on cultural variables.\textsuperscript{21,30,31} Other factors such as depression, and diminished “nutritional self-management”, leading to changes in dietary behaviour and food intakes.\textsuperscript{32,33} This is particularly evident among men over the age of 75\textsuperscript{34,35,36} with low incomes.\textsuperscript{37} Indeed, there is a strong relation between living alone and dietary intakes among men,\textsuperscript{38,39,40} but these findings have not been consistent\textsuperscript{41,42} and are even less so among women.\textsuperscript{43} Information on the influence of living arrangements on dietary intake in seniors appears to be inconclusive and may depend on cultural or other differences in the samples studied.

In conclusion, research in this area has clearly identified two poles: widowed individuals (men or women) in good health and without financial constraints who continued to drive and remained independent in their dietary self-management; and those in poor health with no informal support, who experienced difficulties obtaining formal support services, had few social contacts and were at great nutritional risk, since their food preparation abilities and dietary intakes could become extremely limited. These qualitative observations are supported by secondary analyses of Quebec nutrition survey data.\textsuperscript{44}

The heterogeneity and interaction between needs and adaptive dietary strategies often cloud the issue, and only longitudinal studies will permit clarification of these differential influences on healthy eating. Given the complexity of these interactions and the fact that most research to date has been cross-sectional, it is virtually impossible to tease apart the specific influence of individual or collective determinants.

**KNOWLEDGE GAPS AND DIRECTIONS FOR FURTHER RESEARCH**

Gaps in knowledge were detected in the course of this review. These are summarized in the following section, which also suggests directions for further investigation. Further study and regular dietary monitoring are needed in order to know more about food consumption habits in seniors. These investigations must be adapted to the reality of targeted aging populations using precise measurements, diverse approaches, appropriate methods and accurate dietary assessment tools to reflect the great heterogeneity typical of older populations.

The research agenda should be focussed on interactions between individual and collective determinants of healthy eating that are unique to the elderly in Canada. To achieve this goal, longitudinal studies should be conducted to examine the epidemiological and social aspects of aging; describe the chronology of events and the direction of causal relations; determine and track seniors’ food intakes, their food-related needs, variability over time in dietary needs and resources; the interactions that exist between age- and gender-related changes in socio-demographic factors and eating; and how healthy eating could interface with disease prevention and health maintenance.

Further study is necessary in order to understand which foods favour healthy aging. Patterns of use, long-term effectiveness and the safety of dietary supplements, probiotics and functional foods in aging populations must be further investigated. Indeed, more needs to be known about what constitutes “healthy eating” in seniors to permit the modification of our food guidance system and provide Canadian seniors with targeted dietary guidance.

More specifically, we must further examine health beliefs, and food beliefs and practices that have symbolic or traditional importance to determine how knowledge, beliefs and attitudes translate into eating behaviour in older adults, especially at advanced ages. More research is needed to clarify the relative contribution of income, ethnic background and other personal predictors of healthy eating – self-control, emotions, resistance to change, time constraints, lack of knowledge – and environmental factors governing food availability and cost. Information is needed linking nutritional services, health, psychological, cognitive and social characteristics, as well as financial constraints to procuring healthy foods. More information is needed on barriers, both real and perceived, that discourage healthy eating. For instance, the impact of therapeutic or self-imposed restrictive diets on dietary adequacy is not known. Investigations must simultaneously address interdependent attributes, such as biological parameters, clinical factors and the psychosocial dimension, together with dietary and psychosocial variables.

To encourage and facilitate healthy eating in older people, a broad range of improved and expanded services must be offered to seniors as an adjunct to the healthy eating message. The availability, acceptability, utilization and effectiveness of nutritional interventions and community programs should be rigorously examined, evaluated and refined in order to foster independence in community-dwelling seniors living in urban or rural communities.

Other issues that require further study to facilitate healthy eating in older Canadians should be clarified by academics, clinicians, public health authorities, the food industry and decision-makers at both the regional and national level. These may include evaluation of the effectiveness of provision and marketing of appropriate, affordable nutrient-dense foods and upgrading the food market and transporta-
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