

Portland State University

PDXScholar

Community Health Faculty Publications and
Presentations

School of Community Health

11-1-2012

Health Behaviour Changes after Diagnosis of Chronic Illness Among Canadians Aged 50 or Older

Jason T. Newsom

Portland State University

Nathalie Huguet

Portland State University

Pamela L. Ramage-Morin

Statistics Canada

Michael Joseph McCarthy

University of Cincinnati

Julie Bernier

Statistics Canada

Follow this and additional works at: https://pdxscholar.library.pdx.edu/commhealth_fac

See next page for additional authors



Part of the [Community-Based Research Commons](#), and the [Community Health and Preventive Medicine Commons](#)

Let us know how access to this document benefits you.

Citation Details

Newsom J., Huguet, N., Ramage-Morin, P., McCarthy, M., Bernier, J., Kaplan, M., & McFarland, B. (2012). Health behaviour changes after diagnosis of chronic illness among Canadians aged 50 or older. *Health Reports / Statistics Canada, Canadian Centre For Health Information = Rapports Sur La Santé / Statistique Canada, Centre Canadien D'information Sur La Santé*, 23(4), 49-53.

This Article is brought to you for free and open access. It has been accepted for inclusion in Community Health Faculty Publications and Presentations by an authorized administrator of PDXScholar. Please contact us if we can make this document more accessible: pdxscholar@pdx.edu.

Authors

Jason T. Newsom, Nathalie Huguét, Pamela L. Ramage-Morin, Michael Joseph McCarthy, Julie Bernier, Mark S. Kaplan, and Bentson H. McFarland

Article

Health behaviour changes after diagnosis of chronic illness among Canadians aged 50 or older

by Jason T. Newson, Nathalie Huguét,
Pamela L. Ramage-Morin, Michael J. McCarthy,
Julie Bernier, Mark S. Kaplan and Bentson H. McFarland

November, 2012



How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca, email us at infostats@statcan.gc.ca, or telephone us, Monday to Friday from 8:30 a.m. to 4:30 p.m., at the following numbers:

Statistics Canada's National Contact Centre

Toll-free telephone (Canada and United States):

Inquiries line	1-800-263-1136
National telecommunications device for the hearing impaired	1-800-363-7629
Fax line	1-877-287-4369

Local or international calls:

Inquiries line	1-613-951-8116
Fax line	1-613-951-0581

Depository Services Program

Inquiries line	1-800-635-7943
Fax line	1-800-565-7757

To access this product

This product, Catalogue no. 82-003-X, is available free in electronic format. To obtain a single issue, visit our website, www.statcan.gc.ca, and browse by "Key resource" > "Publications."

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "About us" > "The agency" > "Providing services to Canadians."

Published by authority of the Minister responsible for
Statistics Canada

© Minister of Industry, 2012

All rights reserved. Use of this publication is governed by the
Statistics Canada Open Licence Agreement ([http://www.
statcan.gc.ca/reference/copyright-droit-auteur-eng.htm](http://www.statcan.gc.ca/reference/copyright-droit-auteur-eng.htm)).

Cette publication est aussi disponible en français.

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Standard symbols

The following symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0 ^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
P	preliminary
r	revised
X	suppressed to meet the confidentiality requirements of the <i>Statistics Act</i>
E	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

Health behaviour changes after diagnosis of chronic illness among Canadians aged 50 or older

by Jason T. Newsom, Nathalie Huguet, Pamela L. Ramage-Morin, Michael J. McCarthy, Julie Bernier, Mark S. Kaplan and Bentson H. McFarland

Released online November 21, 2012

Abstract

Changes in health behaviours (smoking, physical activity, alcohol consumption, and fruit and vegetable consumption) after diagnosis of chronic health conditions (heart disease, cancer, stroke, respiratory disease, and diabetes) were examined among Canadians aged 50 or older. Results from 12 years of longitudinal data from the Canadian National Population Health Survey indicated relatively modest changes in behaviour. Although significant decreases in smoking were observed among all groups except those with respiratory disease, at least 75% of smokers did not quit. No significant changes emerged in the percentage meeting physical activity recommendations, except those with diabetes, or in excessive alcohol consumption, except those with diabetes and respiratory disease. The percentage reporting the recommended minimum fruit and vegetable intake did not increase significantly among any group.

Keywords

Aged, cancer, diabetes, disease management, exercise, heart disease, lifestyle, middle age, nutrition, respiratory disease, secondary prevention, smoking cessation, stroke

Authors

Jason T. Newsom (1-503-725-8588; newsomj@pdx.edu), Nathalie Huguet and Mark S. Kaplan are with Portland State University, Portland, Oregon. Pamela L. Ramage-Morin (1-613-951-1760; pamelaramage-morin@statcan.gc.ca) and Julie Bernier (1-613-951-4556; julie.bernier@statcan.gc.ca) are with the Health Analysis Division at Statistics Canada, Ottawa, Ontario, K1A 0T6. Michael J. McCarthy is with the University of Cincinnati. Bentson H. McFarland is with Oregon Health and Science University.

Heart disease, cancer, stroke, respiratory disease and diabetes are among the leading causes of death in Canada.¹ Worldwide, these chronic conditions account for 60% of all deaths.² Since they are influenced by modifiable behaviours, they are considered largely preventable.^{3,4} For people with a chronic illness, adopting a healthier lifestyle, such as smoking cessation, increased physical activity, eliminating heavy alcohol consumption and improving diet, can extend longevity, reduce the recurrence of an event and enhance quality of life.⁵⁻⁷

Population-level information about lifestyle changes among people diagnosed with chronic conditions is lacking. Previous studies have examined behaviour change among small samples of individuals with a specific condition, and many studies have been based on retrospective accounts.^{8,9} As well, most research on secondary prevention has taken place in the United States where access to health care and behaviour modification programs is variable. Only a handful of studies have been conducted in Europe or Australia where access to health care is more universal.^{10,11} A literature review did not reveal any studies that used population-based data for Canada.

The present analysis examines changes in smoking, physical activity,

alcohol consumption and diet in a representative sample of Canadians aged 50 or older diagnosed with a major chronic condition (see *The data*). Based on prospective design, in which behaviours are assessed before and after the diagnosis, the study avoids potential biases from retrospective accounts of post-diagnosis behaviour change.

Smoking cessation

Smoking cessation was the most commonly reported behaviour change—the percentage of people who smoked decreased significantly following the diagnosis of heart disease, diabetes, cancer and stroke (Table 1). Among people with heart disease, for example, the prevalence of smoking declined from around 14% to less than 11%. Those

Table 1
Prevalence of health behaviours pre- and post-diagnosis of selected chronic conditions by sex and age group, household population aged 50 or older, Canada, 1994/1995 to 2006/2007

Selected chronic condition/ health behaviour	Total		Sex				Age group			
	Pre- diag- nosis	Post- diag- nosis	Men		Women		50 to 64		65 or older	
			Pre- diag- nosis	Post- diag- nosis	Pre- diag- nosis	Post- diag- nosis	Pre- diag- nosis	Post- diag- nosis	Pre- diag- nosis	Post- diag- nosis
Heart disease (number)	905		390		515		373		532	
Current smoker	14.4	10.8*	15.8	13.2 [†]	13.3	8.8 [‡]	25.7	19.4 [‡]	10.4	7.7
Physically active	51.6	53.9	54.3	60.2	49.4	48.7	47.1	58.5	53.5	51.9
Alcohol consumption										
Never or low	62.8	65.6	49.5	50.3	74.0	78.5 [†]	64.8	56.0	62.0	69.7 [‡]
Moderate	28.2	25.2	36.7	33.5	21.1	18.1 [†]	24.7 [‡]	30.8	29.7	22.8 [‡]
Excessive	9.0	9.2 [‡]	13.8	16.2 [‡]	4.9 [‡]	3.4 [‡]	10.6 [‡]	13.3 [‡]	8.3 [‡]	7.5 [‡]
5 or more daily fruit/vegetable servings	41.9	51.4	41.7 [‡]	53.8	42.0 [‡]	49.9	37.8 [‡]	50.7	52.8 [‡]	53.0 [‡]
Diabetes (number)	478		196		282		253		225	
Current smoker	15.1	11.7*	16.5 [‡]	13.1 [‡]	14.1 [‡]	10.7 [‡]	20.7 [‡]	14.7 [‡]	12.3 [‡]	10.1 [‡]
Physically active	49.7	56.2*	53.5	64.2	47.0	50.7	48.4	64.2	50.4	51.7 [‡]
Alcohol consumption										
Never or low	66.8	72.5	53.2	61.8	76.3	80.6	64.2	71.6	68.2	73.1
Moderate	23.0	22.5	29.9	32.0	18.2 [‡]	15.3 [‡]	25.6 [‡]	21.5 [‡]	21.6	23.1 [‡]
Excessive	10.2 [‡]	5.0 [‡]	16.9 [‡]	F	5.5 [‡]	F	10.2 [‡]	6.9	10.2 [‡]	F
5 or more daily fruit/vegetable servings	34.5 [‡]	41.8	28.1 [‡]	37.3 [‡]	40.1 [‡]	45.7 [‡]	34.4 [‡]	42.8 [‡]	F	F
Cancer (number)	497		227		270		232		265	
Current smoker	17.2	13.5*	19.7 [‡]	15.8 [‡]	14.9 [‡]	11.4 [‡]	31.2 [‡]	23.4 [‡]	11.8 [‡]	9.7 [‡]
Physically active	49.8	51.9	51.4	57.1	48.4	47.3	44.6	57.3	52.1	49.6
Alcohol consumption										
Never or low	59.9	63.4	56.8	57.1	63.5	70.7	47.1	61.7	66.0	64.2
Moderate	30.5	29.9	33.5	F	27.2	F	40.7 [‡]	26.4 [‡]	25.7	31.5
Excessive	9.5 [‡]	6.7 [‡]	9.7 [‡]	F	9.4 [‡]	F	12.2 [‡]	F	8.3 [‡]	F
5 or more daily fruit/vegetable servings	37.9	43.2 [‡]	33.9 [‡]	32.9 [‡]	40.8 [‡]	50.9 [‡]	39.9 [‡]	54.9	32.5 [‡]	F
Stroke (number)	368		156		212		100		268	
Current smoker	17.0	12.5* [‡]	16.2 [‡]	14.7 [‡]	17.6 [‡]	10.6 [‡]	34.7 [‡]	26.2 [‡]	13.8 [‡]	10.0 [‡]
Physically active	49.6	46.2	59.0	59.4	41.9	35.5 [†]	54.6 [‡]	56.4 [‡]	48.3	43.6
Alcohol consumption										
Never or low	70.1	77.4*	62.0	74.1	76.4	80.0	72.4	73.2	69.6	78.3
Moderate	19.2 [‡]	F	F	F	F	F	F	F	F	F
Excessive	10.7 [‡]	F	F	F	F	F	F	F	F	F
5 or more daily fruit/vegetable servings	F	33.0 [‡]	F	F	F	F	F	F	F	F
Respiratory disease (number)	409		149		260		190		219	
Current smoker	25.2	23.9	26.3 [‡]	24.7 [‡]	24.5	23.4 [‡]	36.2 [‡]	33.0 [‡]	21.0	20.4
Physically active	51.6	44.1*	58.2	52.5	47.2	38.6	55.4	59.3	49.9	37.4 [‡]
Alcohol consumption										
Never or low	64.0	56.7	56.6	43.6	68.4	64.5	46.0 [‡]	48.1	71.6	60.4
Moderate	23.3	35.4*	22.8 [‡]	F	23.5 [‡]	F	27.6 [‡]	38.3 [‡]	21.4	34.1
Excessive	12.8 [‡]	7.9* [‡]	20.6 [‡]	F	F	F	26.4 [‡]	F	7.0 [‡]	F
5 or more daily fruit/vegetable servings	27.1 [‡]	31.4 [‡]	F	F	30.2 [‡]	33.3 [‡]	31.3 [‡]	33.7 [‡]	F	F

* significantly different from pre-diagnosis (p<0.05)

[†] pre- to post-diagnosis change significantly different from change among men (p<0.05)

[‡] pre- to post-diagnosis change significantly different from change among 50-to-64 age group (p<0.05)

[‡] use with caution

F too unreliable to be published

Notes: Tests of group differences by sex and age group were conducted using logistic regression in which post-test differences were predicted by group membership, controlling for pre-test differences. Significant differences indicate greater change from pre-test to post-test in one of the groups. Pre-values are based on the last interview wave in which respondents reported no diagnosis of the condition. Post-values are based on the same interview wave in which respondents reported diagnosis of the condition (0 to 2 years). Missing information for alcohol and fruit and vegetable consumption is due to small cell size (n < 10). Fruit and vegetable consumption data were available only for cycles 5 to 7.

Source: 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

diagnosed with respiratory disease were the exception—not only were they more likely to smoke before diagnosis (25%), but there was no significant decrease in the percentage who were smokers after diagnosis.

Except for those with respiratory disease, smokers' daily cigarette consumption fell significantly (Figure 1). This decline in smoking may, in part, be due to the new diagnosis, but it may also reflect a community-wide trend—even among the healthy comparison group, the percentage of current smokers ($N = 1,103$) decreased slightly over the two-year period from 23% to 21% ($p < .05$). However, regardless of the chronic

condition, the majority (approximately 75%) of those who smoked continued to do so after diagnosis (Table 1).

Leisure-time physical activity

Only people with diabetes reported a post-diagnosis increase in leisure-time physical activity. Initially, close to 50% of this population engaged in physical activity at least three times a week; after diagnosis, the figure was about 56%. In addition, only among people diagnosed with diabetes did average energy expenditure change significantly: from 1.1 to 1.4 kcal/kg/day ($p < .001$). Although significant, this increase is not large. Also, it was people aged 50 to

64 with diabetes who tended to become active; seniors were less likely to increase their activity.

And among people diagnosed with respiratory disease, the percentage who were physically active fell from 52% to 44%. Again, age was a factor, as seniors were more likely to become inactive post-diagnosis than were 50- to 64-year-olds.

This was in contrast to the pattern of physical activity among the healthy comparison group. Initially, this group ($N = 1,053$) was more likely to be physically active during leisure-time, and their likelihood of being active rose over the two-year period from 58% to 63% ($p < .05$).

The data

The longitudinal National Population Health Survey (NPHS) followed 17,276 individuals who were aged 12 or older in 1994/1995. Interviews were conducted every two years. The NPHS design, sampling procedures, data collection, and response rates by cycles are described in detail elsewhere.¹² Data for this study are from cycles 1 to 7 (1994/1995 to 2006/2007) and pertain to respondents aged 50 or older at the first cycle ($N=5,404$) who initially reported no chronic condition, but who, in a subsequent cycle, reported a new diagnosis of one of five chronic conditions. The mean age of the sample was 65.5 (SD = 10.3), and slightly more than half (54.1%) were women. The primary focus is a prospective comparison of pre- and post-diagnosis (two years) health behaviour among people reporting a new diagnosis during the 12 years covered by the study. Cycles 2 and 3 were used to examine health behaviour changes among a healthy comparison group who did not have any of the five health conditions.

At each cycle, respondents were asked, "Do you have any of the following long-term (lasting or expecting to last at least six months) conditions that have been diagnosed by a health care professional?" The five conditions selected for this analysis were "heart disease," "cancer" (skin cancer excluded), "effects of stroke," "chronic bronchitis or emphysema" (asthma excluded), and "diabetes."

The smoking measures used in this study were self-reported smoking status (never, former or current) and number of cigarettes per day.

Physical activity was measured by the reported frequency and duration of participation in 20 leisure-time activities (for example, walking for exercise, yoga) in the previous three months. Participation in any activity at least three times per week was considered "physically active." A continuous measure of energy expenditure (kcal/kg/day) was derived from the frequency and duration of activities.¹³

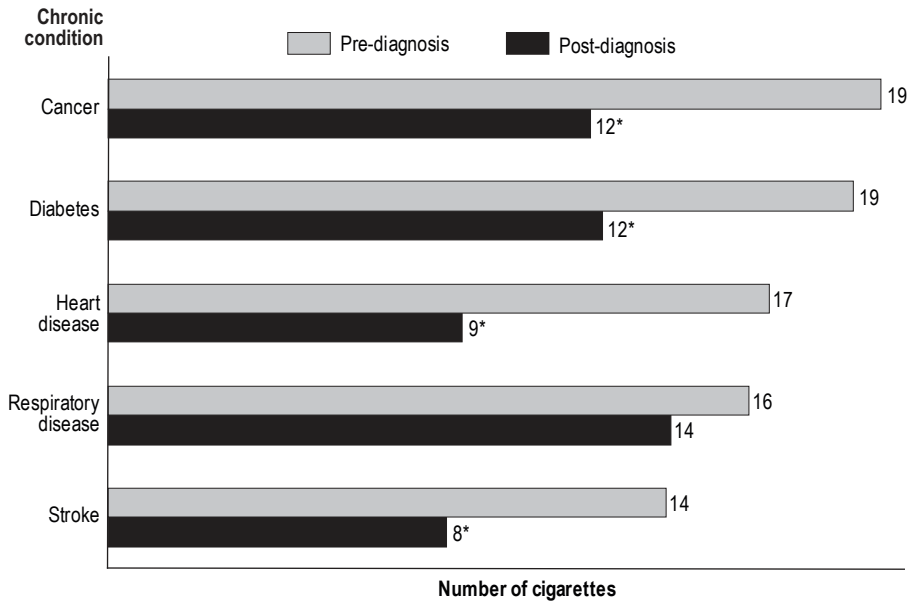
Respondents' alcohol consumption was defined as *never or low* (never drinks to less than 1 drink per week), *moderate* (2 or fewer drinks per day and 1 to 14 drinks per week for men; 2 or fewer drinks per day and 1 to 9 drinks per week for women), and *excessive* (more than 2 drinks per day or more than 14 drinks per week for men; more than 2 drinks per day or more than 9 drinks per week for women).¹⁴

Responses to six questions about the frequency of fruit and vegetable consumption were used to determine what percentage attained minimum recommended daily intake. The recommendation for servings per day is based on an average portion size of 80g, which, studies suggest, approximates the amount consumed on each occasion.¹⁵ The current target is seven servings of fruit and vegetables per day for Canadians older than age 50,¹⁶ but fewer than 12% of the sample reported consuming this amount. Therefore, respondents were classified as meeting the recommended minimum if they reported consuming fruit and vegetables five or more times per day. This is consistent with Canada's Food Guide recommendations before 1992,¹⁷ as well as the minimum recommended by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO),¹⁸ and in several other countries.¹⁷⁻²⁰ Diet information was available only for cycles 5, 6 and 7 of the NPHS.

Analyses were weighted and adjusted for the complex sampling design using SAS 9.2 or SUDAAN 10.0 with balance repeated replication. Rao-Scott chi-square²¹ obtained from SAS PROC SURVEYFREQ using discordant cells (0-1 versus 1-0 responses) was used to test for significant change between pre- and post-diagnosis.²² (The McNemar test, which is typically used for this comparison, is not available in SAS PROC SURVEYFREQ or SUDAAN.) Paired t-tests were used to compare pre- and post-diagnosis health behaviours with continuous measures. Logistic regression models controlling for pre-diagnosis levels of health behaviours were used to compare sex and age differences in health behaviour pre- and post-diagnosis. A significant coefficient for one of these socio-demographic variables indicates greater change from pre- to post-diagnosis in one of the groups.²³

This study has a number of limitations. Chronic conditions and health behaviours were based on self-reports. While it is unlikely that respondents would report having been diagnosed with a major condition if it did not exist,²⁴⁻²⁸ underreporting is possible.²⁹ Self-reported smoking status is generally considered accurate. The NPHS leisure-time physical activity measure was more extensive than those available in most large health surveys, but was, by definition, limited to leisure time. Other physical activity, for example, at work, for transport and for rehabilitation, was excluded. Fruit and vegetable consumption was based on the reported frequency of consumption, and may not correspond precisely to the number of servings. NPHS data were collected every two years, so behaviour changes between cycles may have been missed; for example, smoking cessation attempts and remission. Moreover, changes observed over a two-year period may not be maintained over the long-term.

Figure 1
Mean number of cigarettes smoked per day, pre- and post-diagnosis of chronic condition, current smokers aged 50 or older, Canada, 1994/1995 to 2006/2007

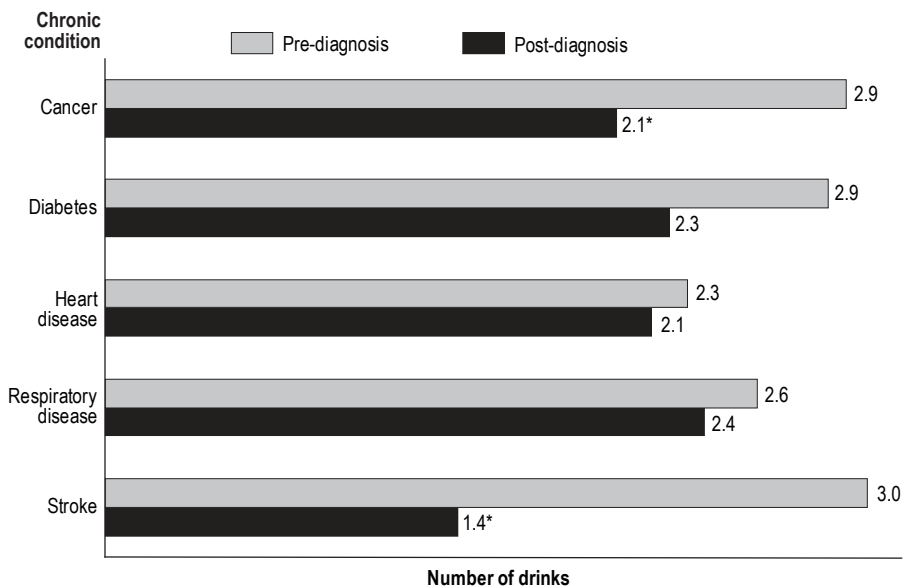


* significantly different from pre-diagnosis ($p < 0.05$)

Note: Because of rounding, bars indicating the same number of cigarettes may have different lengths.

Source: 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

Figure 2
Mean number of alcohol drinks consumed per week, pre- and post-diagnosis of chronic condition, current drinkers (past 12 months) aged 50 or older, Canada, 1994/1995 to 2006/2007



* significantly different from pre-diagnosis ($p < 0.05$)

Note: Because of rounding, bars indicating the same number of drinks may have different lengths.

Source: 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

Fear or concern that physical activity might be dangerous could be a deterrent for individuals with chronic conditions, particularly, heart-related ailments. However, for clinically stable patients without ischemia, exercise under the supervision of a physician has less risk than sedentary behaviour.³⁰

Alcohol consumption

Following a diagnosis of a chronic condition, individuals' alcohol consumption tended to decrease. For example, among those diagnosed with diabetes, the percentage who drank excessively (more than 2 drinks per day or more than 14 drinks a week for men; more than 2 drinks per day or more than 9 drinks a week for women) fell from about 10% to 5% (Table 1). Among those with respiratory disease, the prevalence of excessive drinking declined from almost 13% to 8%. Current drinkers diagnosed with cancer or stroke averaged significantly fewer drinks each week (Figure 2).

Alcohol consumption among the healthy comparison group remained stable over the study period—16% drank excessively, 55% drank moderately, and 29% abstained or drank very little.

Fruit and vegetable consumption

Before they were diagnosed, the percentage of the study population who averaged five or more servings of fruit and vegetables a day ranged from 27% to 42%. No significant post-diagnosis increases emerged in the percentages eating the minimum number of servings, although among those with diabetes, the average daily number of servings rose from 4.4 to 5.2 ($p < .01$). The fruit and vegetable intake of the healthy comparison group did not change over the study period, with approximately 32% consuming five servings a day.

Conclusion

Secondary prevention can improve longevity, enhance quality of life, and reduce medical expenses. This study reveals that people rarely made positive changes in lifestyle behaviours after they had been diagnosed with a chronic

condition. Smoking cessation and reductions in the number of cigarettes smoked were the changes most commonly reported, but the vast majority of smokers continued to smoke.

People with diabetes were the most likely to report positive behaviour changes, although the improvements were modest. Those diagnosed with diabetes reduced smoking and excessive

drinking and increased their leisure-time physical activity and fruit and vegetable consumption. By contrast, people diagnosed with respiratory disease reported no change in smoking or fruit and vegetable consumption, and were less likely to be physically active. Over the same period, a reduction in excessive drinking was the only change in health behaviours reported for this group. ■

Acknowledgements

This work was supported by a grant from the U.S. National Institutes of Health: National Institute on Aging R01 AG034211 (J. T. Newsom). We thank Jillian Oderkirk, Adrienne Feldstein, Javier Nieto, and Victor Stevens for helpful feedback at earlier stages of this paper.

References

1. Health Canada. *Leading Causes of Death and Hospitalization in Canada, 2008*. Available at: <http://www.phac-aspc.gc.ca/publicat/lcd-pcd97/table1-eng.php>. Accessed July 19, 2011.
2. World Health Organization. *Preventing Chronic Diseases: A Vital Investment: WHO Global Report, 2005*. Available at: http://www.who.int/chp/chronic_disease_report/en/index.html. Accessed July 19, 2011.
3. Knoops KT, de Groot LC, Kromhout D, et al. Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: the HALE project. *Journal of the American Medical Association* 2004; 292(12): 1433-9.
4. Stampfer MJ, Hu FB, Manson JE, et al. Primary prevention of coronary heart disease in women through diet and lifestyle. *New England Journal of Medicine* 2000; 343(1): 16-22.
5. Aldana SG, Whitmer WR, Greenlaw R, et al. Cardiovascular risk reductions associated with aggressive lifestyle modification and cardiac rehabilitation. *Heart Lung* 2003; 32(6): 374-82.
6. Van Spall HG, Chong A, Tu JV. Inpatient smoking-cessation counseling and all-cause mortality in patients with acute myocardial infarction. *American Heart Journal* 2007; 154(2): 213-20.
7. Rønnevik PK, Gundersen T, Abrahamsen AM. Effect of smoking habits and timolol treatment on mortality and reinfarction in patients surviving acute myocardial infarction. *British Heart Journal* 1985; 54(2): 134-9.
8. Bolman C, de Vries H, van Breukelen G. A minimal-contact intervention for cardiac inpatients: long-term effects on smoking cessation. *Preventive Medicine* 2002; 35(2): 181-92.
9. Mróz LW, Chapman GE, Oliffe JL, Bottorff JL. Prostate cancer, masculinity and food. Rationales for perceived diet change. *Appetite* 2010; 55(3): 398-406.
10. Hawkes AL, Lynch BM, Youlden DR, et al. Health behaviors of Australian colorectal cancer survivors, compared with noncancer population controls. *Support Care Cancer* 2008; 16(10): 1097-104.
11. van Gool CH, Kempen GI, Penninx BW, et al. Chronic disease and lifestyle transitions: results from the Longitudinal Aging Study Amsterdam. *Journal of Aging and Health* 2007; 19(3): 416-38.
12. Swain L, Catlin G, Beaudet MP. The National Population Health Survey--its longitudinal nature. *Health Reports* 1999; 10(4): 69-82.
13. Statistics Canada. *National Population Health Survey Overview 1994-95* (Catalogue 82-567) Ottawa: Statistics Canada, 1995.
14. Center for Addiction and Mental Health. *Low-risk Drinking Guidelines, 2011*. Available at: http://www.camh.net/About_Addiction_Mental_Health/Drug_and_Addiction_Information/low_risk_drinking_guideline. Accessed July 19, 2011.
15. Ashfield-Watt PA, Welch AA, Day NE, Bingham SA. Is 'five-a-day' an effective way of increasing fruit and vegetable intakes? *Public Health Nutrition* 2004; 7(2): 257-61.
16. Health Canada. *Canada's Food Guides*. Available at: <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php>. Accessed March 6, 2012.
17. Health Canada. *Canada's Food Guides from 1942 to 1992*. Available at: http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/context/fg_history-histoire_ga-eng.php. Accessed March 19, 2012.
18. World Health Organization and Food and Agriculture Organization of the United Nations. *Fruit and Vegetables for Health: Report of a Joint FAO/WHO Workshop*. Kobe, Japan: September, 2004.
19. British Dietetic Association. *Food Fact Sheet*. Available at: <http://www.bda.uk.com/foodfacts/FruitVeg.pdf>. Accessed March 6, 2012.
20. US Department of Agriculture. *Dietary Guidelines for Americans 2005*. Available at: <http://www.health.gov/dietaryguidelines/dga2005/document/>. Accessed March 6, 2012.
21. Rao JNK, Scott AJ. The analysis of categorical data from complex sample surveys: chi-squared tests for goodness-of-fit and independence in two-way tables. *Journal of the American Statistical Association* 1981; 76: 221-30.
22. Agresti A. *Categorical Data Analysis*, 2nd Edition. New York, NY: Wiley, 2002.
23. Newsom, JT. Basic longitudinal analysis approaches for continuous and categorical variables. In: Newsom JT, Jones RN, Hofer WM, eds. *Longitudinal Data Analysis: A Practical Guide for Researchers in Aging, Health, and Social Science*. New York: Routledge, 2012: 143-80.
24. Manuel DG, Lim JJ, Tanuseputro P, Stukel TA. How many people have had a myocardial infarction? Prevalence estimated using historical hospital data. *BMC Public Health* 2007; 7: 174.
25. Giles WH, Croft JB, Keenan NL, et al. The validity of self-reported hypertension and correlates of hypertension awareness among Blacks and Whites within the stroke belt. *American Journal of Preventive Medicine* 1995; 11: 163-9.
26. Vargas CM, Burt VL, Gillum RF, Pamuk ER. Validity of self-reported hypertension in the National Health and Nutrition Examination Survey III, 1988-1991. *Preventive Medicine* 1997; 26: 678-85.
27. Manson JE, Rimm EB, Stampfer MJ, et al. Physical activity and incidence of non-insulin-dependent diabetes mellitus in women. *Lancet* 1991; 338: 774-8.
28. Rimm EB, Giovannucci EL, Willett WC, et al. Prospective study of alcohol consumption and risk of coronary disease in men. *Lancet* 1991; 338: 464-8.
29. Chou PHB, Wister A. From cues to action: Information seeking and exercise self-care among older adults managing chronic illness. *Canadian Journal of Aging* 2005; 24: 395-408.
30. Hamer M, Stamatakis E. Physical activity and mortality in men and women with diagnosed cardiovascular disease. *European Journal of Cardiovascular Prevention and Rehabilitation* 2009; 16(2): 156-60.