

Evidence-Informed Recommendations for Public Health in Reducing Breast Cancer Risk — April 2011 —

This syntheses was conducted by Health Evidence

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INTRODUCTION

Scope of the problem

Breast cancer is the most common cancer among North American women, excluding skin cancers^{1,2}. In terms of lifetime risk, one in 9 women is expected to develop breast cancer and one in 28 is expected to die from the disease³. In Canada, it is estimated that 5,300 women will die from breast cancer in 2010¹. While the incidence rate for breast cancer among Canadian women only increased slightly from 2009 to 2010 (101.1 per 100,000 101.7)¹, the burden of illness associated with breast cancer continues to be significant and associated with over \$454 million in health care expenditures for all women over a lifetime⁴. Given many of the risk factors for breast cancer are modifiable, it is ever more important to identify and implement population wide efforts to reduce these risk factors.

The evidence on breast cancer prevention

Consequently, the role of prevention and early detection is of increased importance. It has been established that weight, physical activity, alcohol consumption, and tobacco use are recognized risk factors for developing breast cancer^{2,5-8}. More specifically, there is an inverse association between physical activity and postmenopausal breast cancer with risk reductions ranging from 20% to 80%. For pre- and postmenopausal breast cancer combined, physical activity was associated with a 15–20% decreased risk⁹. Similar results have been reported for obesity and postmenopausal breast cancer risk^{10,11}. In a recent meta-analysis alcohol consumption was found to be significantly associated with breast cancer risk (OR 1.21; 95% CI 1.04,1.41)¹², along with tobacco use (active and passive smoking) (OR 1.3; 95% CI 1.17, 1.45)¹³. Finally there is evidence to suggest that early age of tobacco use is associated with a 20% increase in breast cancer risk¹⁴. To reduce the risk of developing breast cancer, the Canadian Cancer

Society recommends women should eat a healthy diet, maintain a healthy body weight, be physically active, and reduce alcohol consumption and tobacco use³. Despite these recommendations the most recent Canadian Community Health Survey results illustrate that 53.6% of Canadian women are overweight or obese, while 57.2% are physically inactive¹⁵. In addition, WHO's Global Status Report on Alcohol and Health illustrated that alcohol consumption among Canadian females was moderately high with approximately 75% of women aged 15 years or older reporting alcohol consumption in the past 12 months¹⁶. Furthermore, the 2004 Canadian Addiction Survey identified more than 20% of Canadian adults aged 15 years or older exceeded the Low Risk Drinking Guidelines^{17;18}.

In addition to modifying these lifestyle behaviours, breast cancer screening in women aged 50-69 has been shown to decrease breast cancer mortality rates¹⁹. Despite the evidence demonstrating that organized screening programs reduce breast cancer mortality between 15% to 25%, participation in screening programs among some sub-populations (low socio-economic status, and minority women) remains below the optimal level of 70%^{3;19}. It has been suggested that policy and environmental approaches to breast cancer prevention and early detection are necessary to impact behaviour, and are generally more cost-effective^{7;20}. Public health departments in Canada are uniquely positioned to play a major role in influencing breast cancer prevention and early detection behaviour.

Public health's role in breast cancer prevention

The public health sector in Canada is responsible for promoting the health of the population and preventing disease²¹. Consequently, organized breast cancer screening programs exist in all provinces and territories for women between 50 and 69 years of age¹⁹. These programs are particularly important since primary prevention of breast cancer has been limited due to the fact that risk factors such as weight, physical activity and alcohol consumption have proven difficult to modify at both the individual and population level¹⁹. However, considering causal links have been established between body weight, physical activity, alcohol consumption, and tobacco use, and risk for breast cancer^{2;3;8}, the most effective public health programs must be implemented to modify these risk factors. Public health departments in Canada currently provide services to prevent breast cancer and promote early detection²², but improvements in the uptake of effective interventions are needed²³. Until effective population-wide behaviour modification programs and interventions are identified and implemented, screening appears to be the best mechanism for the reduction of breast cancer-related morbidity and mortality.

Closing the gap between what we know and what is being done in public health

The goals set out by the Ontario Ministry of Health and Long-Term Care for early detection by 2010 were to reduce breast cancer mortality by 10% and increase the uptake of screening mammography in women aged 50-69 to 70%²⁴. This goal has been partially achieved with 73.2% of Ontario females aged 50 to 69 self-reporting mammography screening between 2006-2008²⁵ and 72.5% of Canadian women reporting mammograms during this same time period²⁵. While significant improvements in early detection rates have occurred there is still much work to be done to facilitate screening among certain populations, as well as individual and population level lifestyle behaviours that result in reduced breast cancer risk. There is an ongoing need for public health decision-makers to access information more effectively and efficiently on the most rigorous research evidence²⁶. However, public health decision-makers are often confronted with issues that require a timely response even before research exists²⁶. While knowledge brokers can be instrumental in providing guidance and knowledge sharing²⁷, a recent review evaluated the effectiveness of diffusion and dissemination strategies for cancer control interventions²³. The findings illustrated that there is no single knowledge translation intervention that is effective for all cancers²³. For breast cancer prevention and early detection, there was some evidence that physician education during counselling was an effective dietary intervention. Media campaigns may result in increased knowledge and awareness of

behaviours to reduce risks²³. While some strategies targeting health care providers and individuals (training, education facilitators, workshops, mass media) have some effect in producing dietary change, the research does not provide strong evidence to recommend any one dissemination strategy as effective in promoting the uptake of cancer control interventions^{23,28}. Furthermore, some dissemination strategies tend to include cancer control interventions which are ineffective, such as postal delivery to health professionals and passive dissemination strategies²³. With respect to screening, effective interventions had multiple components that combined behavioural and cognitive interventions such as invitations or mailed reminders and office system interventions (i.e., prompts)²³. The purpose of this paper is to build on previous research to develop evidence-based recommendations for public health practice so as to facilitate the adoption of effective public health programs^{29,30} and subsequently reduce the incidence of breast cancer^{3,19,27,31}.

METHODS

Literature was identified through database searches and by canvassing key informants. Public health-relevant breast cancer risk reduction recommendations were developed by a panel of experts using a Delphi review process. The initial guidelines were finalized in April 2010. In preparing this paper for publication in early 2011, we updated the search of health-evidence in February 2011, made changes to the guidelines as indicated by the new evidence, and sought approval for these changes by the expert panel.

Research Question

Searches were conducted for synthesized research that addressed the following questions:

- 1) Is mammography screening effective in reducing breast cancer mortality among women?
- 2) What public health-related interventions are effective in reducing breast cancer risk among women?

Literature Search

We originally searched the health-evidence.ca registry in April 2010, and subsequently February 2011, to locate systematic reviews and meta-analyses published in English between 1998 and October 2010 that answered the research questions identified above. The systematic reviews that populate www.health-evidence.ca are identified through an ongoing, comprehensive search that includes 7 electronic databases (MEDLINE, EMBASE, CINAHL, PsycINFO, Sociological Abstracts, BIOSIS, SportDiscus), handsearching of 50 public health and health promotion journals, and reference list searches of all relevant reviews; these reviews are assessed for relevance and quality by two independent reviewers and indexed using common public health terms³². Relevant reviews captured in health-evidence.ca searches are quality assessed, indexed, and publicly available in the searchable registry within six months. A MEDLINE search was also conducted to February 2011 to explore the association between alcohol and breast cancer risk. In addition we consulted key experts in the field of breast cancer prevention for additional articles, and reviewed the reference lists of all identified articles. An overview of this process is depicted in Figure 1 below.

Inclusion and Exclusion

The following evidence was included: systematic reviews, meta-analyses, and overviews of reviews that assessed the effectiveness of interventions to reduce breast cancer risk and mortality. We included research that assessed the effectiveness of breast cancer screening to reduce mortality among women and lifestyle interventions (weight, physical activity, and alcohol consumption) to reduce the risk of

developing breast cancer among women. Inclusion criteria were: 1) the article was a systematic review, meta-analysis or overview of reviews; 2) the article assessed breast cancer risk reduction interventions, and 3) the results could be generalized to the Canadian population. Articles pertaining to tobacco use reduction and cessation were not included given the emphasis public health departments in Canada already focus on tobacco use. Furthermore, we assessed the methodological quality of all relevant reviews and excluded all those assessed as having weak methodological quality (quality rating below 5 on a 10 point scale). Assessment of inclusion was done independently by three reviewers (LG, MD, KD). Where discrepancies existed discussion occurred until consensus was reached.

Assessment of Methodological Quality

Relevant reviews were assessed for methodological quality by any two of the following independent reviewers using a pre-existing tool³³ that has been assessed for reliability³⁴(LG, MD, PR, KD). The ten criteria used to assess methodological quality were: 1) a clearly focused question was stated; 2) inclusion criteria were explicitly stated; 3) a comprehensive search strategy described; 4) adequate number of years covered in the search; 5) description of level of evidence provided; 6) assessment of the methodological rigor of primary studies conducted and results described; 7) methodological quality of primary studies assessed by two reviewers and level of agreement between reviewers provided; 8) tests of homogeneity or assessment of similarity of results across studies conducted and reported; 9) appropriate weighting of primary studies conducted; and 10) author's interpretation of results were supported by the data. Each criterion, worth one point each, was given equal weight in the overall methodological assessment score. Reviews were given an overall score out of 10 and classified into three categories: Strong, Moderate, and Weak. Reviews receiving an overall rating of seven or more were considered strong, those with a score of five or six, moderate, and those with four or less, weak. Discrepancies were resolved by discussion.

Summary Statement Development

Short summary statements (2-4 pages) outlining the issue that the review addressed; the results of the quality assessment; and the findings of the systematic review and implications for public health practice and policy were written for all of the reviews assessed as being of strong or moderate methodological quality. Three members of the research team (KD, LG and PR) wrote the summary statements and the principal investigator (MD) reviewed each for quality and comprehensiveness. These summaries were completed in July 2010.

Data Extraction

One member (LG) of the research team extracted data from the included reviews. Key findings were extracted from each review article along with important details of the studies included in the reviews (e.g. outcomes specific to sub-populations) and were categorized (e.g. screening strategies, lifestyle interventions). After extraction was complete, categorized findings were synthesized. MD acted as a second reviewer by checking what data LG had extracted from each review. Any disagreements were resolved through consensus.

Recommendation Development

Two members of the team (LG and MD) developed draft public health practice recommendations based on the synthesized evidence. A panel of experts in breast cancer prevention in the Canadian context was convened. Potential candidates were identified by contacting the Canadian Breast Cancer Foundation and reviewing the member lists of cancer organizations and by searching the internet for additional names. In addition, co-investigators contacted local experts for suggestions. Of forty experts invited, twenty-two

agreed to participate in the Delphi review process and 16 contributed to refining the recommendations that emerged from our synthesis of the evidence. The members of the expert panel represent Canadian Provincial Ministries, non-government cancer agencies, cancer researchers, physicians, and public health staff with responsibility for cancer prevention. See the Appendix for a complete list of expert panel members.

An online Delphi method was used to assess the recommendations for relevance and appropriateness to public health practice in Canada and to rank the relative priority of each of the recommendations. An online system for reviewing the recommendations was created, and a link to the online system was sent to panellists via e-mail. Panellists were asked to review the first draft of recommendations and provide feedback in the form of a 'vote' as to whether or not each recommendation should be brought forward as a priority for public health intervention. Each recommendation was worded as an implication for practice; for example, "*public health screening promotion interventions should identify and target high-risk populations*". For each recommendation, the online system provided panellists with the evidence summarized by the research team, including the type of intervention (screening, lifestyle, etc), author, title, methodological quality rating, and an overview of the evidence including statistical results, such as "*access enhancing interventions resulted in a 19% increase in mammography use (95% CI 10.4 - 27.4)*". Next to the evidence presented, panellists were given links to a summary of the reviews on health-evidence.ca, as well as a link to the full-text version of the review from which data were drawn. Where free-text versions were not available, copyright permissions were purchased in order to provide full pdf versions of all reviews that supported each recommendation. An example of the form completed by reviewers appears in Figure 2 below.

Reviewers were asked to prioritize recommendations and sub-recommendations in a yes/no form, and to provide open-ended comments as part of their feedback. These comments were then used to refine the recommendations for a second iteration of the content that was also made available online for reviewers with an e-mailed link distributed. Based on expert panel feedback, the recommendations were revised and this process of feedback and refinement of the recommendations continued with two additional rounds of Delphi process review until consensus on the final set of recommendations was reached.

RESULTS

The searches of health-evidence.ca yielded 55 systematic reviews. Searches of MEDLINE yielded 44 papers on alcohol consumption, and an additional 13 reviews and reports were identified by key informants. A total of 112 articles were reviewed for relevance.

Of the 112 results, 15 were excluded for not being systematic reviews or meta-analyses, overviews or synopses of reviews, 46 did not assess breast cancer risk reduction interventions and/or report outcomes, and an additional 5 were excluded because the population studied was too dissimilar to Canadian women. An additional 12 reviews deemed relevant were excluded because they were assessed as being of low methodological quality. Of the remaining 34 reviews, 31 were systematic reviews and meta-analyses, one was an overview of reviews, another was a synopsis of an overview, and one was a report. The 34 reviews are listed in Appendix A.

Several of the reviews evaluated more than one intervention related to breast cancer risk reduction. Fourteen articles³⁵⁻⁴⁸ were focused on the effectiveness of breast cancer screening. Nine articles^{12,49-56} were focused on the association between modifiable risk factors and risk of breast cancer, and twenty-five articles^{16,35-39,41,42,44,46,48,52,54-65} assessed the effectiveness of public health-relevant interventions to change behaviour including improving weight, exercise and limiting alcohol consumption.

The following tables are the public health-relevant, evidence-based recommendations and sub-recommendations that address breast cancer risk reduction in Canada.

Recommendation #1: Key target audiences for breast cancer prevention

Recommendations	Author, Year
<p><i>Public health breast cancer screening promotion should target women 50 to 69 years of age. Public health initiatives should identify and target high risk and underscreened populations (where screening rates are low), including minority and women with low socio-economic status.</i></p>	<p>Armstrong 2007 Bailey 2005 Denhaerynck 2003 Edwards 2003 Gotzsche 2009 Granader 2008 Han 2009 Legler 2002 Lord 2007 Mandelblatt 2003 Nelson 2009 Noble 2009 Ringash 2001</p>
<p>Interventions should be culturally, literacy, and urban/rural sensitive.</p>	<p>Armstrong 2007 Bailey 2005 Han 2009</p>
<p>Individuals at greater than average risk are best identified in a clinical setting where individualized plans can be developed.</p>	<p>Edwards 2003 Legler 2002</p>
<p>Women outside the main target group (e.g. women 39-49 years of age identified at high risk) should have access to high-quality screening.</p>	<p>Armstrong 2007 Granader 2008 Lord 2007 Mandelblatt 2003 Ringash 2001</p>
<p>Interventions for underscreened populations should address known specific barriers, for example, language and convenience.</p>	<p>Bailey 2005 Legler 2002 Spadea, 2010</p>
<p>Interventions that are peer-led have been shown to be effective.</p>	<p>Bailey 2005 Legler 2002 Spadea, 2010</p>
<p>Where costs (e.g. transportation, childcare, loss of work time) represent a barrier to screening participation, interventions to reduce costs should be implemented.</p>	<p>Bailey 2005 Legler 2002 Spadea, 2010</p>
<p>Strategies to attract immigrant women should be developed and evaluated.</p>	<p>Denhaerynck 2003 Legler 2002</p>
<p>Balanced information regarding screening benefits and risks should be provided to aid women in deciding whether to participate in screening.</p>	<p>Armstrong 2007 Gotzsche 2009 Noble 2009</p>

Recommendation #2: Key breast cancer risk factors to modify

Recommendations	Author, Year
<p><i>Public health breast cancer prevention should include lifestyle interventions to address modifiable risk factors that may reduce breast cancer risk.</i></p> <p><i>Recognizing that risk factors for breast cancer are common with other chronic diseases, a comprehensive chronic disease prevention strategy (that includes breast cancer prevention) is recommended.</i></p>	<p>Asikainen 2004 Brunner 2007 Foster 2005 Heath 2006 Ogilvie 2004 Pignone 2003 Thoroood 2007</p>
<p>Interventions should aim to increase physical activity, improve nutrition, and reduce alcohol consumption; interventions may combine these lifestyle outcomes.</p>	<p>Asikainen 2004 Brennan 2010 Brunner 2007 Cummings 2009 Foster 2005 Ogilvie 2004 Pignone 2003 Thoroood 2007</p>
<p>Interventions should aim to change policy to improve population lifestyles.</p>	<p>Heath 2006</p>

Recommendation #3: Effective public health breast cancer prevention interventions

Recommendations	Author, Year
<p><i>Intervention strategies that are effective in changing behaviour related to breast cancer risk reduction include:</i></p>	
<p>Interventions to improve knowledge, attitudes, awareness, and/or beliefs about the importance of breast screening. Changing attitudes and beliefs may require interventions that include individualized counselling.</p>	<p>Edwards 2003 Pignone 2003 Han 2009 Spadea, 2010</p>
<p>Personal breast cancer risk factor assessment, especially for high-risk women.</p>	<p>Edwards 2003</p>
<p>Invitations to mammography (though this is less effective for underscreened populations), phone calls, and educational material.</p>	<p>Bailey 2005 Bonfill 2001 Denhaerynck 2003 Spadea, 2010</p>
<p>Interventions targeted to practitioners, and para-professionals that aim to improve screening compliance/ attendance, and:</p> <ul style="list-style-type: none"> • Include information to help identify patients who will most likely benefit from screening. This could include information on local underscreened populations. • Physician reminder and recall systems that identify who is due and/or overdue for screening, • Provide patient-targeted information that could be distributed through 	<p>Armstrong 2007 Baron, 2010 Bonfill 2001 Gotzsche 2009 Mandelblatt 2003 Mandelblatt 1999 Noble 2009 Spadea, 2010</p>

<p>physicians.</p> <ul style="list-style-type: none"> • Provide balanced information regarding screening benefits and risks to support women in deciding whether to participate in screening. 	
<p>Mass media campaigns designed to increase awareness and promote screening, especially for underscreened populations.</p>	<p>Grilli 2002 Legler 2002</p>
<p>Specific to physical activity promotion, community-scale and street-scale urban design and land use regulations, policies, and practices (e.g., street design, pedestrian friendly designs).</p>	<p>Heath 2006</p>
<p>Interventions that are peer-led have been shown to be effective at increasing physical activity.</p>	<p>Webel, 2010</p>
<p>Dietary advice (especially in a clinic setting), and nutrition education interventions in church and worksite settings.</p>	<p>Pignone 2003 Thorogood 2007</p>
<p>Alcohol reduction interventions including policies: making alcohol more expensive and less available; banning of alcohol advertising; drink-driving countermeasures; and individually directed interventions to drinkers already at risk. School-based alcohol prevention education does not reduce harm, but public information and education programmes can increase attention to alcohol on public and political agendas.</p>	<p>Anderson 2009 Beaglehole 2009 Cummings 2009 Ellison 2001 Collaborative Group on Hormonal Factors in Breast Cancer 2002 Smith-Warner 1998 WHO, 2011</p>

REFERENCE LIST

- [1] Canadian Breast Cancer Foundation. 2010 Canadian Breast Cancer Statistics Announced. Canadian Breast Cancer Foundation 2010 Available from: <http://www.cbcbf.org/en-US/About%20CBCF/Media%20Centre/News%20Releases/2010%20Breast%20Cancer%20Stats.aspx>.
- [2] American Cancer Society. Breast Cancer. American Cancer Society 2010 Available from: <http://www.cancer.org/acs/groups/cid/documents/webcontent/003090-pdf.pdf>.
- [3] Canadian Cancer Society/National Cancer Institute of Canada. Canadian Cancer Statistics 2010. Toronto, Canada; 2010.
- [4] Will BP, Berthelot JM, Le Petit C, Tomiak EM, Verma S, Evans WK. Estimates of the lifetime costs of breast cancer treatment in Canada. *Eur J Cancer* 2000 Apr;36(6):724-735.
- [5] Centers for Disease Control. Nutrition and physical activity. Atlanta, GA; 2000.
- [6] Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. *Obesity Reviews* 2004;5(Suppl. 1):4-85.
- [7] Gotay CC. Behavior and cancer prevention. *J Clin Oncol* 2005 Jan 10;23(2):301-310.
- [8] Canadian Breast Cancer Foundation. Breast cancer: Risk and risk reduction. Canadian Breast Cancer Foundation 2010 [cited 2010 December 10]; Available from: http://www.cbcbf.org/breastcancer/bc_risk.asp.
- [9] Monninkhof EM, Elias SG, Vleems FA, van der Tweel I, Schuit AJ, Voskuil DW, et al. Physical activity and breast cancer: A systematic review. *Epidemiology* 2007;18(1):137-157.
- [10] Dobbins M, DeCorby K, Robeson P, Husson H. Overweight and obesity and risk of cancer: A Canadian perspective. Moffat, ON: Chronic Disease Management Division for Chronic Disease Prevention and Control, Public Health Agency of Canada; 2009.
- [11] Renehan AG, Tyson M, Egger M, Heller RF, Zwahlen M. Body-mass index and incidence of cancer: A systematic review and meta-analysis of prospective observational studies. *The Lancet* 2008 Feb 16;371(9612):569-578.
- [12] Brennan SF, Cantwell MM, Cardwell CR, Velentzis LS, Woodside JV. Dietary patterns and breast cancer risk: A systematic review and meta-analysis. *The American Journal of Clinical Nutrition* 2010 May 1;91(5):1294-1302.
- [13] Sadri G, Mahjub H. Passive or active smoking, which is more relevant to breast cancer. *Saudi Medical Journal* 2007;28(2):254-258.
- [14] Collishaw NE, Boyd NF, Cantor KP, Hammond SK, Johnson KC, Millar J, et al. Canadian expert panel on tobacco smoke and breast cancer risk. Toronto, Canada: Ontario Tobacco Research Unit, OTRU Special Report Series; 2009.
- [15] Statistics Canada. Canadian Community Health Survey - Annual Component (CCHS). Ottawa, ON: Statistics Canada; 2010.
- [16] World Health Organization. Global status report on alcohol and health. Geneva, Switzerland: World Health Organization; 2011.
- [17] Bondy SJ, Rehm J, Ashley MJ, Walsh G, Single E, Room R. Low-risk drinking guidelines: The scientific evidence. *Can J Public Health* 1999;90(4):264-270.
- [18] Rehm J, Giesbrecht N, Popova S, Patra J, Adlaf E, Mann R. Overview of positive and negative effects of alcohol consumption -- Implications for preventive policies in Canada. Toronto, Ontario: Centre for Addiction and Mental Health; 2006.
- [19] Public Health Agency of Canada. Organized breast cancer screening programs in Canada: Report on program performance in 2003 and 2004. Ottawa, ON: Public Health Agency of Canada; 2008.

- [20] Bishop B, Glanz K. The role of behavioral science theory in the development and implementation of public health interventions. *Annu Rev Public Health* 2010 Apr 1;31(1):399-418.
- [21] Canadian Institutes of Health Research. The future of public health in Canada: Developing a public health system for the 21st century. Canadian Institutes of Health Research 2003 Available from: http://www.cihr-irsc.gc.ca/e/documents/FuturePHCanada_Exec-Sum_June2003.pdf.
- [22] Health Canada. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Performance. Health Canada 2002 [cited 2010 November 30];1-38. Available from: http://www.phac-aspc.gc.ca/publicat/eiwg-qtie/chap_1_e.html.
- [23] Ellis P, Robinson P, Ciliska D, Armour T, Brouwers M, O'Brien MA, et al. A systematic review of studies evaluating diffusion and dissemination of selected cancer control interventions. *Health Psychol* 2005;24(5):488-500.
- [24] Ministry of Health and Long Term Care. Mandatory health programs and services guidelines. www.gov.on.ca:80/MOH/english/pub/pubhealth.manprog/mhp_toc.html . 2001. 10-15-2007.
- [25] Shields M, Wilkins K. An update on mammography use in Canada. Ottawa, On: Statistics Canada; 2009. Report No.: Catalogue no. 82-003-X.
- [26] LaPelle NR, Luckmann R, Hatheway Simpson E, Martin ER. Identifying strategies to improve access to credible and relevant information for public health professionals: A qualitative study. *BMC Public Health* 2006;6:89-101.
- [27] Dobbins M, Robeson P, Ciliska D, Hanna S, Cameron R, O'Mara L, et al. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implementation Science* 2009;4:23.
- [28] Ciliska D, Robinson P, Armour T, Ellis P, Brouwers M, Gauld M, et al. Diffusion and dissemination of evidence-based dietary strategies for the prevention of cancer. *Nutrition Journal* 2005;4(13).
- [29] The Integrated Pan-Canadian Healthy Living Strategy. Ottawa, Ontario, Canada: The Secretariat for the Intersectoral Healthy Living Network; 2005.
- [30] Canadian Institution of Health Research (CIHR), Canadian Population Health Initiative (CPH). Obesity in Canada: Identifying policy priorities. Ottawa, ON: Canadian Institute for Health Information; 2003.
- [31] Dobbins M, DeCorby K, Twiddy T. A knowledge transfer strategy for public health decision makers. *Worldviews on Evidence-Based Nursing* 2004;1(2):120-128.
- [32] Dobbins M, DeCorby K, Robeson P, Husson H, Tirilis D, Greco L. A knowledge management tool for public health: health-evidence.ca. *BMC Public Health* 2010;10:496.
- [33] Oxman AD, Thomson MA, Davis DA, Haynes RB. No magic bullets: A systematic review of 102 trials of interventions to improve professional practice. *Can Med Assoc J* 1995 Nov 15;153(10):1423-1431.
- [34] Oxman AD, Guyatt GH. Validation of an index of the quality of review articles. *J Clin Epidemiol* 1991 Oct;44(11):1271-1278.
- [35] Armstrong K, Moye E, Williams S, Berlin JA, Reynolds EE. Screening mammography in women 40 to 49 years of age: A systematic review for the American College of Physicians. *Ann Intern Med* 2007 Apr 3;146(7):516-526.
- [36] Bailey TM, Delva J, Gretebeck K, Siefert K, Ismail A. A systematic review of mammography educational interventions for low-income women. *Am J Health Promot* 2005 Nov 1;20(2):96-107.
- [37] Denhaerynck K, Lesaffre E, Baele J, Cortebeek K, Van Overstraete E, Buntinx F. Mammography screening attendance: Meta-analysis of the effect of direct-contact invitation. *Am J Prev Med* 2003 Jan 1;25(3):195-203.
- [38] Edwards A, Unigwe S, Elwyn G, Hood K. Effects of communicating individual risks in screening programmes: Cochrane systematic review. *BMJ: British Medical Journal* 2003 Jan 1;327(7417):703-707.

- [39] Gotzsche PC, Nielsen M. Screening for breast cancer with mammography. *Cochrane Database of Systematic Reviews* 2006 Jan 1;2006(4):Art. No.: CD001877.
- [40] Granader EJ, Dwamena B, Carlos RC. MRI and mammography surveillance of women at increased risk for breast cancer: Recommendations using an evidence-based approach. *Acad Radiol* 2008 Dec 1;15(12):1590-1595.
- [41] Han HR, Lee JE, Kim J, Hedlin HK, Song H, Kim MT. A meta-analysis of interventions to promote mammography among ethnic minority women. *Nurs Res* 2009 Jul;58(4):246-254.
- [42] Legler J, Meissner HI, Coyne C, Breen N, Chollette V, Rimer BK. The effectiveness of interventions to promote mammography among women with historically lower rates of screening. *Cancer Epidemiology, Biomarkers & Prevention* 2002 Jan 1;11(1):59-71.
- [43] Lord SJ, Lei W, Craft P, Cawson JN, Morris I, Walleser S, et al. A systematic review of the effectiveness of magnetic resonance imaging (MRI) as an addition to mammography and ultrasound in screening young women at high risk of breast cancer. *Eur J Cancer* 2007 Jan 1;43(13):1905-1917.
- [44] Mandelblatt J, Saha S, Teutsch S, Hoerger T, Siu AL, Atkins D, et al. The cost-effectiveness of screening mammography beyond age 65 years: A systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med* 2003 Jan 1;139(10):835-842.
- [45] Nelson HD, Tyne K, Naik A, Bougatos C, Chan BK, Humphrey L. Screening for breast cancer: An update for the U.S. Preventive Services Task Force. *Ann Intern Med* 2009 Jan 1;151(10):727-737.
- [46] Noble M, Bruening W, Uhl S, Schoelles K. Computer-aided detection mammography for breast cancer screening: Systematic review and meta-analysis. *Arch Gynecol Obstet* 2009 Jan 1;279(6):881-890.
- [47] Ringash J. Preventative health care, 2001 update: Screening mammography among women aged 40-49 years at average risk of breast cancer. *CMAJ: Canadian Medical Association Journal* 2001 Jan 1;164(4):469-476.
- [48] Spadea T, Bellini S, Kunst A, Stirbu I, Costa G. The impact of interventions to improve attendance in female cancer screening among lower socioeconomic groups: A review. *Prev Med* 2010 Apr;50(4):159-164.
- [49] Asikainen TM, Kukkonen-Harjula K, Miilunpalo S. Exercise for health for early postmenopausal women: A systematic review of randomised controlled trials. *Sports Med* 2004 Jan 1;34(11):753-778.
- [50] Brunner EJ, Rees K, Ward K, Burke M, Thorogood M. Dietary advice for reducing cardiovascular risk. *Cochrane Database of Systematic Reviews* 2007 Jan 1;2007(4):Art. No.: CD002128.
- [51] Foster C, Hillsdon M, Thorogood M. Interventions for promoting physical activity. *Cochrane Database of Systematic Reviews* 2005 Jan 1;2005(1):Art. No.: CD003180.
- [52] Heath GW, Brownson RC, Kruger J, Miles R, Powell KE, Ramsey LT. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: A systematic review. *Journal of Physical Activity and Health* 2006 Jan 1;3(Suppl 1):S55-S76.
- [53] Ogilvie D, Egan M, Hamilton V, Petticrew M. Promoting walking and cycling as an alternative to using cars: Systematic review. *BMJ: British Medical Journal* 2004 Jan 1;329(7469):763-767.
- [54] Pignone M, Ammerman A, Fernandez L, Orleans CT, Pender N, Woolf S, et al. Counseling to promote a healthy diet in adults: A summary of evidence for the U.S. Preventive Services Task Force. *Am J Prev Med* 2003 Jan 1;24(1):75-92.
- [55] Thorogood M, Simera I, Dowler E, Summerbell C, Brunner E. A systematic review of population and community dietary interventions to prevent cancer. *Nutrition Research Reviews* 2007 Jan 28;20:74-88.
- [56] Cummings SR, Tice JA, Bauer S, Browner WS, Cuzick J, Ziv E, et al. Prevention of breast cancer in postmenopausal women: Approaches to estimating and reducing risk. *J Natl Cancer Inst* 2009;101(6):384-398.

- [57] Anderson P, Chrisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *The Lancet* 2009;373:2234-2246.
- [58] Beaglehole R, Bonita R. Alcohol: A global health priority (Commentary). *The Lancet* 2009;373:2173-2174.
- [59] Bonfill X, Marzo M, Pladevall M, Marti J, Emparanza JI. Strategies for increasing the participation of women in community breast cancer screening. *Cochrane Database of Systematic Reviews* 2001 Jan 22;2001(1):Art. No.: CD002943.
- [60] Collaborative Group on Hormonal Factors in Breast Cancer. Alcohol, tobacco and breast cancer - Collaborative reanalysis of individual data from 53 epidemiological studies, including 58 515 women with breast cancer and 95 067 women without the disease. *Br J Cancer* 2002;87:1234-1245.
- [61] Ellison RC, Zhang Y, McLennan CE, Rothman KJ. Exploring the relation of alcohol consumption to risk of breast cancer. *Am J Epidemiol* 2001;154(8):740-747.
- [62] Grilli R, Ramsy C, Minozzi S. Mass media interventions: Effects on health services utilization. *Cochrane Database of Systematic Reviews* 2002 Jan 21;2002(1):Art. Id.: CD000389.
- [63] Mandelblatt JS, Yabroff KR. Effectiveness of interventions designed to increase mammography use: A meta-analysis of provider-targeted strategies. *Cancer Epidemiology, Biomarkers & Prevention* 1999 Jan 1;8(9):759-767.
- [64] Smith-Warner SA, Spiegelman D, Yaun S-S, van den Brandt PA, Folsom AR, Goldbohm A, et al. Alcohol and breast cancer in women: A pooled analysis of cohort studies. *JAMA* 1998;279(8):535-540.
- [65] Webel AR, Okonsky J, Trompeta J, Holzemer WL. A systematic review of the effectiveness of peer-based interventions on health-related behaviors in adults. *Am J Public Health* 2010 Feb;100(2):247-253.
- [66] The Early Detection of Breast Cancer Working Group. Guideline for the early detection of breast cancer. Edmonton, AB: Toward Optimized Practice; 2007.
- [67] Kushi LH, Byers T, Doyle C, Bandera EV, McCullough M, McTiernan A, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: Reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin* 2006;56(5):254-281.
- [68] American College of Obstetricians and Gynecologists. Breast cancer screening. Washington, D.C.: American College of Obstetricians and Gynecologists; 2003. Report No.: ACOG practice bulletin no. 42.
- [69] U.S.Preventive Services Task Force. Screening for breast cancer. Rockville, MD: Agency for Healthcare Research and Quality; 2009.
- [70] Brouwers M, De Vito C, Carroll J, Cotterchio M, Dobbins M, Lent B, et al. Interventions to increase the uptake of cancer screening: Guideline recommendations. Hamilton, ON: Cancer Care Ontario; 2009. Report No.: 15-7.
- [71] The Community Guide Branch. Cancer prevention and control: Client-oriented screening interventions. <http://www.thecommunityguide.org/cancer/screening/client-oriented/index.html> 2011 [cited 2011 April 5]; Available from: <http://www.thecommunityguide.org/cancer/screening/client-oriented/index.html>.
- [72] The Community Guide Branch. Cancer prevention and control: Provider-oriented screening interventions. <http://www.thecommunityguide.org/cancer/screening/provider-oriented/index.html> 2011 [cited 2011 April 5]; Available from: <http://www.thecommunityguide.org/cancer/screening/provider-oriented/index.html>.
- [73] Farmer AP, Legare F, Turcot L, Grimshaw J, Harvey E, McGowan JL, et al. Printed educational materials: Effects on professional practice and health care outcomes. *Cochrane Databases of Systematic Reviews* 2008;(3):Art. No.:CD004398.

- [74] Flodgren G, Deane K, Dickinson HO, Kirk S, Alberti H, Beyer FR, et al. Interventions to change the behaviour of health professionals and the organisation of care to promote weight reduction in overweight and obese people. *Cochrane Database of Systematic Reviews* 2010;(3).
- [75] Gillespie M. *Communicating effectively with physicians to influence practice: A rapid review of the evidence*. Brampton, ON: Region of Peel; 2010.

APPENDIX A

Reference List: 34 Articles that Support the Recommendations

1. Anderson, P., Chisholm, D., & Fuhr, D. C. (2009). [Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol](#). *The Lancet*, 373, 2234-2246.
2. Armstrong, K., Moye, E., Williams, S., Berlin, J. A., & Reynolds, E. E. (2007). [Screening mammography in women 40 to 49 years of age: A systematic review for the American College of Physicians](#). *Annals of Internal Medicine*, 146, 516-526.
3. Asikainen, T. M., Kukkonen-Harjula, K., & Miilunpalo, S. (2004). [Exercise for health for early postmenopausal women: A systematic review of randomised controlled trials](#). *Sports Medicine*, 34, 753-778.
4. Bailey, T. M., Delva, J., Gretebeck, K., Siefert, K., & Ismail, A. (2005). [A systematic review of mammography educational interventions for low-income women](#). *American Journal of Health Promotion*, 20, 96-107.
5. Baron, R.C., Melillo, S., Rimer, B.K., Coates, R.J., Kerner, J., Habarta, N., Chattopadhyay, S., Sabatino, S.A., Elder, R., Leeks, K.J. & Task Force on Community Preventive Services. (2010). [Intervention to increase recommendation and delivery of screening for breast, cervical, and colorectal cancers by healthcare providers: A systematic review of provider reminders](#). *American Journal of Preventive Medicine*, 38, 110-117.
6. Beaglehole, R. & Bonita, R. (2009). [Alcohol: a global health priority](#). *The Lancet*, 373, 2173-2174.
7. Bonfill, X., Marzo, M., Pladevall, M., Marti, J., & Emparanza, J. I. (2001). [Strategies for increasing the participation of women in community breast cancer screening](#). *Cochrane Database of Systematic Reviews*, 2001, Art. No.: CD002943.
8. Brennan, S. F., Cantwell, M. M., Cardwell, C. R., Velentzis, L. S., & Woodside, J. V. (2010). Dietary patterns and breast cancer risk: A systematic review and meta-analysis. *American Journal of Clinical Nutrition*, 91, 1294-1302.
9. Brunner, E. J., Rees, K., Ward, K., Burke, M., & Thorogood, M. (2007). [Dietary advice for reducing cardiovascular risk](#). *Cochrane Database of Systematic Reviews*, 2007, Art. No.: CD002128.
10. Collaborative Group on Hormonal Factors in Breast Cancer, N. (2002). [Alcohol, tobacco and breast cancer — collaborative reanalysis of individual data from 53 epidemiological studies, including 58 515 women with breast cancer and 95 067 women without the disease](#). *British Journal of Cancer*, 87, 1234-1245.
11. Cummings, S. R., Tice, J. A., Bauer, S., Browner, W. S., Cuzick, J., Ziv, E. et al. (2009). [Prevention of breast cancer in postmenopausal women: Approaches to estimating and reducing risk](#). *Journal of the National Cancer Institute*, 101, 384-398.
12. Denhaerynck, K., Lesaffre, E., Baele, J., Cortebeeck, K., Van Overstraete, E., & Buntinx, F. (2003). [Mammography screening attendance: Meta-analysis of the effect of direct-contact invitation](#). *American Journal of Preventive Medicine*, 25, 195-203.
13. Edwards, A., Unigwe, S., Elwyn, G., & Hood, K. (2003). [Effects of communicating individual risks in screening programmes: Cochrane systematic review](#). *BMJ: British Medical Journal*, 327, 703-707.
14. Ellison, R. C., Zhang, Y., McLennan, C. E., & Rothman, K. J. (2001). [Exploring the Relation of Alcohol Consumption to Risk of Breast Cancer](#). *American Journal of Epidemiology*, 154, 740-747.
15. Foster, C., Hillsdon, M., & Thorogood, M. (2005). [Interventions for promoting physical activity](#). *Cochrane Database of Systematic Reviews*, 2005, Art. No.: CD003180.
16. Gotzsche, P.C. & Nielsen, M. (2009). [Screening for breast cancer with mammography](#). *Cochrane Database of Systematic Reviews*, 2009, Art. No.: CD001877.

17. Granader, E.J., Dwamena, B., Carols, R.C. (2008). [MRI and mammography surveillance of women at increased risk for breast cancer: Recommendations using an evidence-based approach](#). *Academic Radiology*, 15, 1590-1595.
18. Grilli, R., Ramsy, C., & Minozzi, S. (2002). [Mass media interventions: Effects on health services utilization](#). *Cochrane Database of Systematic Reviews*, 2002, Art. No.: CD000389.
19. Han, H.R., Lee, J.E., Kim, J., Hedlin, H.K., Song, H., Kim, M.T. (2009). [A meta-analysis of interventions to promote mammography among ethnic minority women](#). *Nursing Research*, 58, 246-254.
20. Heath, G. W., Brownson, R. C., Kruger, J., Miles, R., Powell, K. E., & Ramsey, L. T. (2006). [The effectiveness of urban design and land use and transport policies and practices to increase physical activity: A systematic review](#). *Journal of Physical Activity and Health*, 3, S55-S76.
21. Legler, J., Meissner, H. I., Coyne, C., Breen, N., Chollette, V., & Rimer, B. K. (2002). [The effectiveness of interventions to promote mammography among women with historically lower rates of screening](#). *Cancer Epidemiology, Biomarkers & Prevention*, 11, 59-71.
22. Lord, S. J., Lei, W., Craft, P., Cawson, J. N., Morris, I., Walleser, S. et al. (2007). [A systematic review of the effectiveness of magnetic resonance imaging \(MRI\) as an addition to mammography and ultrasound in screening young women at high risk of breast cancer](#). *European Journal of Cancer*, 43, 1905-1917.
23. Mandelblatt, J., Saha, S., Teutsch, S., Hoerger, T., Siu, A. L., Atkins, D. et al. (2003). [The cost-effectiveness of screening mammography beyond age 65 years: A systematic review for the U.S. Preventive Services Task Force](#). *Annals of Internal Medicine*, 139, 835-842.
24. Mandelblatt, J. S. & Yabroff, K. R. (1999). [Effectiveness of interventions designed to increase mammography use: A meta-analysis of provider-targeted strategies](#). *Cancer Epidemiology, Biomarkers & Prevention*, 8, 759-767.
25. Nelson, H.H., Tyne, K., Naik, A., Bougatos, C., Chan, B.K., Humphrey, L. (2009). [Screening for breast cancer: An update for the U.S. Preventive Services Task Force](#). *Annals of Internal Medicine*, 151, 727-737.
26. Noble, M., Bruening, W., Uhl, S., Schoelles, K. (2009). [Computer-aided detection mammography for breast cancer screening: Systematic review and meta-analysis](#). *Archives of Gynecology and Obstetrics*, 279, 881-890
27. Ogilvie, D., Egan, M., Hamilton, V., & Petticrew, M. (2004). [Promoting walking and cycling as an alternative to using cars: Systematic review](#). *BMJ: British Medical Journal*, 329, 763-767.
28. Pignone, M., Ammerman, A., Fernandez, L., Orleans, C. T., Pender, N., Woolf, S. et al. (2003). [Counseling to promote a healthy diet in adults: A summary of evidence for the U.S. Preventive Services Task Force](#). *American Journal of Preventive Medicine*, 24, 75-92.
29. Ringash, J. (2001). [Preventative health care 2001 update: Screening mammography among women aged 40-49 years at average risk of breast cancer](#). *CMAJ: Canadian Medical Association Journal*, 164, 469-476.
30. Smith-Warner, S. A., Spiegelman, D., Yaun, S. S., van den Brandt, P. A., Folsom, A. R., Goldbohm, A. et al. (1998). [Alcohol and breast cancer in women a pooled analysis of cohort studies](#). *Journal of the American Medical Association*, 279, 535-540.
31. Spadea, T., Bellini, S., Kunst, A., Stirbu, I. & Costa, G. (2010). [The impact of interventions to improve attendance in female cancer screening among lower socioeconomic groups: A review](#). *Preventive Medicine*, 50, 159-164.
32. Thorogood, M., Simeria, I., Dowler, E., Summerbell, C., & Brunner, E. (2007). [A systematic review of population and community dietary interventions to prevent cancer](#). *Nutrition Research Reviews*, 20, 74-88.

33. Webel, A.R., Okonsky, J., Trompeta, J., Holzemer & W.L. (2010). [A systematic review of the effectiveness of peer-based interventions on health-related behaviors in adults](#). *American Journal of Public Health*, 100, 247-253.
34. World Health Organization. (2011). *Global status report on alcohol and health 2011*. Geneva: World Health Organization.

APPENDIX B

Expert Panel Members

We thank the expert panel for identifying and reviewing the available evidence about breast cancer prevention in the public health setting in Canada, and developing corresponding practice recommendations.

Heather Chappell MSc CHE	Director, Cancer Control Policy Canadian Cancer Society <i>Ontario</i>
Deb Keen	Director, Primary Prevention Canadian Partnership Against Cancer <i>Ontario</i>
Dr. Catherine M. Sabiston,	McGill University CBCRA/CIHR Operating Grant recipient: Physical activity among breast cancer survivors: Understanding the impact on biological risk factors and psychological health over time <i>Quebec</i>
Dr. David McLean,	Head, BC Cancer Agency Prevention Programs <i>British Columbia</i>
Katie Watters, PHEc	Manager, Program Development & Education Manitoba Breast Screening Program <i>Manitoba</i>
Ms. Lynn Chappell	Director, Cancer System Planning & Performance Erie St. Clair Regional Cancer Program <i>Ontario</i>
Esther Green	Provincial Head, Nursing and Psychosocial Oncology Cancer Care Ontario <i>Ontario</i>
Amanda Hey MD CCFP FCFP	Regional Primary Care Lead Sudbury Regional Hospital - Regional Cancer Program <i>Ontario</i>
Dr. Verna Mai	Director, Screening Cancer Care Ontario <i>Ontario</i>
Mr. Ted Mavor,	Coordinator, Cancer Prevention and Early Detection, Waterloo-Wellington Regional Cancer Program; Co-Chair, Cancer Prevention and Early Detection Networks of Wellington County and Waterloo Region; Waterloo - Wellington Regional representative to Provincial Cancer Prevention & Screening Committee <i>Ontario</i>
Karen Biggs,	Clinical Dietitian, Supportive Care Programme Juravinski Cancer Centre <i>Ontario</i>
Dr. Peter Lovrics,	Associate Professor, General Surgery

	McMaster University <i>Ontario</i>
Dr. Angie Thompson,	Department of Human Kinetics St. Francis Xavier University <i>Nova Scotia</i>
Julia Knight PhD	Leader, Prosserman Centre for Health Research Senior Investigator, Samuel Lunenfeld Research Institute, Mount Sinai Hospital; Associate Professor, Dalla Lana School of Public Health, University of Toronto <i>Ontario</i>