Winnipeg Regional Health Authority
Office régional de la santé de Winnipeg

LIFTING THE BURDEN OF CHRONIC DISEASE

WHAT'S WORKED ♦ WHAT HASN'T ♦ WHAT NEXT

Directional Document

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LIFTING THE BURDEN OF CHRONIC DISEASE

EVIDENCE FOR ACTION: KEY POINTS

Of initiatives to improve chronic disease management, the strongest evidence exists for **delivery system redesign** within primary care. Particular attention should be paid to interventions that

- improve the scheduling and organization of care, especially advanced access;
- address healthcare roles, especially through development of multidisciplinary teams and facilitation of expanded roles for non-physician providers.

While **self-management support** is highly important, not all interventions are effective; therefore, caution is needed in designing and implementing programs. Effective interventions:

- provide what patients cannot easily acquire (e.g., skills), not just information;
- are targeted to patients with the greatest need;
- are, ideally, professionally-led initiatives, integrated into primary care.

Intersectoral **collaboration and partnerships** are essential to address the unmet non-health needs that lead some patients to over-utilize health services.

Despite their popularity, **decision support** and **clinical information systems** have a weaker evidence base than other interventions.

- Decision support tends to have a small impact on provider behaviour and none on patient outcomes. Clinical information systems may be used to facilitate other interventions, but there is little evidence that they, by themselves, improve practice or outcomes.

General guidelines for planning that are preconditions for success are to:

- **Focus on one important change at a time**, not several changes at once.
- Ensure (a) staff input and buy-in before and during implementation; (b) adequate time and resources for implementation; and (c) appropriate evaluation.
- Consider the impact on underserved populations and health disparities.

Individually-directed interventions in the area of prevention and health promotion are important, but their overall impact on population health is modest.

Some **interventions directed at the public** are effective; others have repeatedly failed.

- Mass media appeals do not succeed in changing behaviour. However, well-researched and well-targeted social marketing may have positive results.
- So-called "community-based" campaigns initiated by professionals to encourage healthy lifestyles are not effective. However, evidence supports **community development** initiatives in which residents set their own priorities.

While the health system has primary responsibility for areas under its direct control, it is essential to recognize the major contributions of broad societal factors to chronic disease.

- To change unhealthy lifestyles, it is crucial to **change the environments** that foster them.
- **Policies** that make healthy choices easier, cheaper, and more convenient have a greater impact than interventions directed at individuals or the public.
- Through partnerships and advocacy, healthcare leaders can begin to address the **social determinants** that have a profound effect on health as well as lifestyle behaviour.

Sara Kreindler, D.Phil. * WRHA Research & Evaluation Unit * May, 2008

LIFTING THE BURDEN OF CHRONIC DISEASE

CHRONIC DISEASE: WHAT'S THE EVIDENCE?

	Most Impact	Potential Impact	Less Impact
Chronic Disease Management	Delivery System Redesign • Advanced access • Multidisciplinary teams • Non-physician practitioners • Improving the scheduling and location of care Self-Management Support • Integrated into primary care Community Partnerships • Linkages between health and social services Health System Leadership • Strategic priority-setting • Staff engagement and input • Evaluation of new initiatives	Delivery System Redesign • Case management Self-Management Support • Lay-led programs Community Partnerships • Linkages to specific programs (e.g., exercise) offered within the community.	Decision Support Clinical Information Systems (in the absence of Delivery System Redesign) *Interventions in these areas should not be introduced until there have been major changes in other areas of the CCM.*
Chronic Disease Prevention and Health Promotion	Interventions Directed at Environments • Support policies that make healthy choices more convenient and affordable • Support restrictions on unhealthy products Interventions Directed at the Public • Community development initiatives emerging from residents' priorities Addressing Broader Determinants • Advocate healthy economic, social, environmental policy	Interventions Directed at Environments • Promote healthy workplace and school environments through tangible changes. Interventions Directed at the Public • Well-researched, well-designed social marketing Interventions Directed at Individuals • Evidence-informed individual counselling and/or group programs	Interventions Directed at Environments • Workplace promotional campaigns, contests, etc. • School-based interventions with minimal environmental component Interventions Directed at the Public • Mass media appeals • Community-based campaigns, initiated by health professionals, to encourage healthy lifestyles.

LIFTING THE BURDEN OF CHRONIC DISEASE
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EXECUTIVE SUMMARY

Chronic disease is a serious and growing problem in the Winnipeg Health Region and across Canada. The fact that so much of the illness we see today is chronic in nature has changed the landscape of healthcare, as planners search for better ways to respond to emerging population needs. This paper aims to provide clearer direction to decision-makers by synthesizing the research evidence on how the system can best be designed to support chronic-disease management and prevention.

Two frameworks for envisioning a comprehensive chronic disease strategy are the Chronic Care Model (CCM, which focuses on interventions to improve chronic disease management) and the Expanded Chronic Care Model (which broadens the focus to include interventions that prevent chronic disease and promote health). With a strong emphasis on primary care renewal, these models delineate the components of an effective response to chronic disease. However, research on CCM implementation has shown that it is neither necessary nor desirable to try to introduce the whole model at once. Rather, it is most effective to focus on one highly important change at a time. For this reason, decision-makers need to set priorities by comparing the *strength* of the evidence for different approaches. Based on an extensive review of the literature, including several meta-analyses and systematic reviews, this paper reveals which interventions have the strongest evidence base, and which ones are more weakly supported. It also outlines evidence that can inform the *design and implementation* of interventions.

Of initiatives to improve **chronic disease management**, the strongest evidence exists for **delivery system redesign** within primary care. This broad category encompasses interventions that improve the scheduling and organization of care (in particular, **advanced access**, i.e., enabling clinics to offer same-day appointments) and interventions that reshape healthcare roles (in particular, **multidisciplinary team-based care**, and an expanded role for **non-physician personnel**). Each of these interventions has a strong record of improving care, corroborating the principle that changing the system is more efficient than trying to change individual providers' behaviour. On the other hand, studies suggest that case management can be effective *only* if carefully targeted to those patients least able to manage their own conditions.

Research has also confirmed the importance of **self-management support**; however, not all interventions are effective. Successful programs provide something that patients lack and cannot easily acquire on their own (e.g., skills), not just education and counselling. Studies have also suggested that the most effective interventions are those provided by a healthcare professional and integrated into regular care. Although lay-led self-management programs have been widely adopted on the strength of promising early studies, further research has suggested that their impacts are much smaller than originally believed. Finally, effective interventions are targeted to reach patients with the poorest self-management skills (including patients who face particular disadvantages, such as low literacy) and more severe illness.

In contrast to the above two areas, **decision support** has a much weaker evidence base. Although hundreds of studies have trialed various strategies to increase physicians' adherence to clinical practice guidelines, the results have been inconsistent, and modest at best. Meta-analyses suggest that, on average, decision support has a small (~10%) impact on provider behaviour, and no impact on patient outcomes. Studies have shown that making guidelines accessible to physicians (e.g., through computerized prompts) is not sufficient to change their practice. Similarly, evidence on **clinical information systems** indicates that improved data collection does not necessarily result in improved practice, nor improved outcomes. Although such systems have many theoretical benefits, studies suggest that they do not, on their own, improve care. The literature suggests that decision support and clinical information systems should only be considered *after* more fundamental changes to delivery-system design and self-management support are in place.

Although there is a need for further research on the potential role of various **community partnerships** in chronic disease management, there is clear evidence that greater integration between healthcare and social programs can improve outcomes while reducing costs. Non-health needs (e.g., social support, housing), if unmet, can promote over-utilization of health services. Through intersectoral collaboration, it is possible to ensure that each client receives the services that are the best fit for them, and that money is not wasted on inappropriate services.

It is difficult to quantify the effects of **healthcare organization and leadership** on chronic care. However, research shows that leadership can play an important role in system improvement by showing commitment to high-priority changes, rewarding innovation, and ensuring the use of evidence-informed change management strategies. Important preconditions for success include (a) staff involvement and input before and during implementation; (b) adequate time and resources for implementation; (c) clear goals but flexibility about how staff achieve them; and (d) appropriate evaluation (including consideration of program impact on underserved populations), and use of evaluation results to inform decisions.

Chronic disease prevention is a highly complex area, as health is determined by multiple factors, only some of which are under the control of the healthcare system. However, what healthcare leaders cannot change directly, they can influence through intersectoral collaboration, and through advocacy. It is important to keep the full range of potential actions in mind because the interventions that the healthcare system can accomplish alone are not necessarily the ones with the strongest evidence. In fact, a comprehensive review of the literature suggests that the reverse is true: Policy and environmental changes have a greater impact than attempts to persuade individuals or the public to adopt healthier lifestyles. The second half of the paper explores which interventions are likely to make the greatest contribution to improving population health and reducing health disparities, and how the health system can achieve or support them.

Interventions directed towards individuals have been shown to produce improvements (although not always large ones) in dietary and exercise behaviour, and to help smokers quit. For best results, initiatives should be targeted towards those with the greatest need. However, although individually-focused interventions are important, their overall impact on population health is modest. They are a very inefficient means of trying to change large-scale trends towards unhealthy eating and sedentary lifestyles.

Interventions directed towards the public are often advanced as a way to improve population health; however, some interventions within this category have a history of repeated failure. Abundant research has shown that mass-media campaigns do not succeed in promoting healthy behaviour. More sophisticated social marketing initiatives that are carefully pre-tested and targeted have a better record; however, their effects tend to be modest. Professionally-initiated "community-based" campaigns to encourage healthy lifestyles are among the most widely publicized but least effective interventions. Studies suggest that such initiatives typically attempt to mobilize a group of people who do not consider themselves a community around an issue that they do not consider a priority; not surprisingly, this approach has had minimal impact on health behaviour and outcomes. In contrast, there is evidence to support *community development* approaches, in which community members themselves set the priorities – be they diseases, behaviours, or broader factors that affect health.

Interventions directed at environments show the greatest potential to promote the adoption of healthy lifestyles. Effective policies make healthy choices easier, cheaper, and/or more convenient (e.g., reduced prices on healthy food, urban design that facilitates non-car transportation), or place restrictions on unhealthy choices (e.g., smoke-free legislation). Evidence from the long and successful history of tobacco control, as well as emerging evidence in the areas of diet and exercise, shows that changing unhealthy lifestyles entails changing the environments that foster them. Although the healthcare system cannot accomplish such changes alone, it can support them by (a) partnering with other sectors (e.g., education), (b) providing evidence-informed advocacy, and (c) modeling best practices within healthcare workplaces.

It is also important to recognize that the area of **healthy public policy** goes beyond policies that are explicitly health-related. Policies that alleviate poverty and social disadvantage, or reduce environmental pollution, have a direct impact on factors known to produce or exacerbate chronic disease. Research documenting the importance of social and environmental determinants of health suggests a need to explore ways for the healthcare system to support necessary changes in these areas through collaboration and advocacy.

The information that has been synthesized in this paper suggests the following top-priority areas:

1. **Start with a focus on delivery system redesign, particularly on actions that have proven most effective across a number of settings.**

2. **Then, consider ways to expand and improve self-management support, but ensure that the design of initiatives reflects the best available evidence.**

3. **Actively pursue opportunities for intersectoral collaboration to tackle the unmet non-health needs that are leading some patients to over-utilize health services.**

As next steps, it is recommended that the criteria outlined in this paper be used to guide (a) a high-level environmental scan of regional chronic disease initiatives, identifying current strengths and weaknesses; and (b) prioritization and resource allocation for new initiatives.

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1. INTRODUCTION

Chronic disease is a serious and growing problem in the Winnipeg Health Region and across Canada. Data from the most recent Canadian Community Health Survey indicate that more than half of Winnipeg residents aged 45 and older experience at least one chronic disease;[1] among residents over the age of 65, more than half suffer from *more than one*. Although these figures reflect both physical conditions (e.g., heart disease, cancer, diabetes, arthritis, asthma, etc.) and mental-health conditions (e.g., depression [which frequently appears comorbidly with physical illness]), not all chronic diseases are included; in consequence, this represents a conservative estimate. The fact that so much of the illness we see today is chronic in nature has changed the landscape of healthcare, as planners search for better ways to respond to emerging population needs.[2, 3]

The Winnipeg Regional Health Authority (WRHA) recently adopted a Chronic Disease Framework as the starting point for a proactive, organized overall strategy.[4] This framework emphasizes the need to take a system-wide approach that considers the continuum of services from the promotion of health and prevention of illness, to the identification and treatment of disease, to rehabilitation and supportive care. It illuminates the need for interventions at every point on the continuum in order to achieve the goals of improved overall health outcomes and reduced health disparities. It also outlines the Chronic Care Model and Expanded Chronic Care Model,[2, 5] which delineate the components of an effective response to chronic disease, with a strong emphasis on primary care renewal. The framework advances a vision of a health authority that "looks at the big picture," working on individual parts of the system without losing sight of the whole; that addresses each problem at the most appropriate level, striking as close as possible to its root causes; and that embraces the most current evidence about which interventions to emphasize, where to direct them, and how to implement them. However, the question remains: "What strategy will enable us to make this vision a reality?"

The purpose of this paper is to provide clearer direction to decision-makers by synthesizing the research evidence in this important area. **Its focus will be evidence about how the system can best be designed to support chronic-disease management and prevention** (rather than on treatment approaches for particular chronic diseases). In keeping with the concept of a continuum, the first half of the paper will concentrate on chronic-disease management (using the Chronic Care Model to guide discussion), while the second half will explore prevention and health promotion (using the Expanded version as a guide).♦ In each case, it will drill down into the components of these models, comparing the relative strength of evidence for different interventions. The objective is to distil these extensive literatures into practical guidance that can help the region move forward in its approach to chronic disease.

♦ This paper does not advocate a position on the issue of which conditions should be included in the category of chronic disease. However, the WRHA Framework, like most of the literature on chronic care, focuses on the kinds of illnesses which feature "an uncertain etiology, multiple risk factors, long latency, prolonged affliction, a non-infectious origin, and [effects that may include] impairments or functional disability" (p. 1).[4]

2. THE CHRONIC CARE MODEL

The Chronic Care Model (CCM) was born out of E. H. Wagner's realization that many individuals suffering from chronic disease were not receiving adequate care.[2] He observed that the healthcare system was designed to respond to acute health problems, and that these urgent concerns tended to "crowd out" the routine monitoring and maintenance (let alone prevention) of chronic conditions. As a result, patients' chronic illnesses received little attention until they manifested in acute complications – an undesirable state of affairs for both the patient and the healthcare system. **Wagner recommended that primary care be strengthened and redesigned to better cope with the growing problem of chronic disease.** He proposed a set of evidence-based reforms that fell into six categories: delivery system redesign, support for patient self-management, clinical information systems, decision support, community partnerships, and healthcare organization and leadership. The underlying premise of the CCM is that enabling practice teams and their patients to deal proactively with chronic disease will result in patients receiving better care, enjoying improved clinical outcomes and quality of life, and having less need of healthcare in the long run. The following section explores the CCM as a useful framework for considering various changes that may promote these outcomes.

A growing body of research documents the benefits of implementing the CCM and/or its components. The adoption of CCM-type reforms has been found to generate improvements in processes of care, patient outcomes, and healthcare resource use.[6-9] Yet, despite these promising findings, it is important to recognize that the CCM is actually not a "model" in the sense of a specific template for action. It is more of a menu than a recipe: Each of its components encompasses a wide variety of potential interventions; two organizations could choose two completely non-overlapping sets of interventions yet both exhibit complete fidelity to the CCM.[10] This fact in itself makes it difficult to draw conclusions about the CCM as a package. Furthermore, **although Wagner assumed that the CCM should be introduced as a whole, research suggests that this is not a necessity.** Rather, a variety of combinations of interventions can lead to improved outcomes, no single component appears to be critical, and there is no evidence that the model's components work together synergistically (except in specific cases where one intervention directly facilitates another).[9] Indeed, **it may be counterproductive for organizations to try to introduce the entire CCM at once.** For example, one primary care network – notwithstanding its history of success with system-redesign initiatives (e.g., advanced access) – made little progress over a year of trying to implement the CCM.[11] The model's ambitious scope and lack of specificity – both acceptable characteristics in a conceptual framework – were simply overwhelming to staff attempting to operationalize and implement it. Although some clinical indicators did improve, this did not seem to be attributable to the CCM, since many of the planned interventions were implemented incompletely or not at all, and the desired changes to the process of care failed to take place.[12] The investigators recommended that organizations use the CCM as a backdrop to help leaders see the big picture, but not as a "*change blueprint or training model*" (Hroscikoski et al., 2006, p. 325).[11] To return to the menu analogy, a useful maxim for those contemplating the CCM might be, "Order from the menu, don't order everything on the menu, and don't bite off more than you can chew!"

It is also important to remember that the CCM, for all its breadth and complexity, is directed towards solving one basic problem: the disorganization of chronic disease care,

specifically non-acute care. Its essential aim is to enable the system to ensure that all patients get the care they need (including self-care), when they need it. This aim is of undeniable importance: A system that is chaotic and disjointed, or that is set up in a way that does not make sense for patients or providers, can hardly provide appropriate and efficient care. However, the CCM does not cover the entire continuum of care, nor does it tackle broader issues crucial to reducing the burden of chronic disease. Part Two will address these broader issues as spelled out in the Expanded version of the CCM (CCM-E)[5] and in other literature. The following section will focus more narrowly on the extent to which CCM components can solve the problems they were designed to address.

2.1 Evidence and the CCM

The published literature contains hundreds, if not thousands, of studies relevant to the CCM. Some of these have investigated the CCM as a whole; some have examined other multi-component initiatives based on similar principles; and many have scrutinized particular interventions falling under the rubric of the CCM. To describe and evaluate each of these studies is a task far beyond the scope of this paper. Fortunately, there are already a number of systematic reviews and meta-analyses assessing the CCM and its components. Some of these examine a specific component, while others compare the relative impacts of various components; some focus on a particular disease or set of diseases, while others are not disease-specific. Taken together, they offer a clear picture of the current evidence surrounding the CCM. The evidence presented in this section relies primarily on eleven systematic reviews (including two reviews-of-reviews) and three meta-analyses; five narrative reviews and overviews were also consulted for the sake of thoroughness. The analysis also draws on a number of recent studies that further illuminate the impacts of particular CCM components, the conditions under which certain components are most effective, or important considerations for implementation.

A meta-analysis of 112 controlled studies concluded that interventions with one or more elements of the CCM were, overall, beneficial; however, some components yielded better results than others.[9] **Specifically: *delivery system redesign* and *self-management support* were associated with improved care processes and outcomes; *decision support* was associated with improved processes but not outcomes; *clinical information systems* showed no consistent positive effects; and there were not enough studies to establish the impacts of either *community partnerships* or *health-system organization*.** This snapshot provides a useful starting point for a discussion of CCM-related evidence. To determine the implications for decision-making, it is of course necessary to consider each of the six components in more detail.

2.2. Delivery System Redesign

Of the six CCM components, **delivery system redesign** has the most solid evidence base.[9, 13] This stands to reason: Given that the objective of the CCM is to improve the organization of care, what better solution than to retool poorly designed systems? This component also encompasses the most diverse group of interventions, including the redesign of scheduling systems (advanced access, planned individual or group visits, consolidation of services to allow "one-stop shopping," etc.) and of healthcare roles (multidisciplinary teams, expanded roles for non-physician personnel).

2.2.1. Redesign of Scheduling Systems: Advanced Access and Other Initiatives

There is clear evidence that redesign of scheduling systems can promote timely care.[♦] Many innovations reportedly reduce delays and inefficiencies.[14-17] Advanced access (i.e., enabling clinics to offer same-day appointments), in particular, has accumulated a body of supportive literature.[18-22] One systematic review, focusing on patients with COPD, examined 32 studies in which organizations implemented one or more components of the CCM.[23] All of the organizations that successfully reduced the utilization of emergency and hospital services had one thing in common: advanced access. However, studies have also cautioned that members of vulnerable populations (e.g., the elderly, people with low levels of education or limited English proficiency) may feel less comfortable phoning for an appointment.[19] Evaluation is necessary, and some modifications may be required, to ensure that such groups are not disadvantaged by a new system.

System-redesign projects may also change the location of care, moving certain services into patients' homes or other conveniently accessible venues (e.g., weekly clinics in a downtown mall).[24] Telephone- and computer-based care can also help extend the reach of health services (for those patients with phones or computers).[2, 25]

2.2.2. Multidisciplinary Teams

There is increasing evidence that multidisciplinary teams can improve both the processes and outcomes of care.[26, 27] Findings in this area are not as clear or consistent as those in such areas as advanced access – no doubt because of the great variability in definitions of what constitutes a team, and in the organization and performance of different teams. However, multidisciplinary teams consistently figure among the interventions identified as effective by reviews of initiatives to improve chronic-disease care.[8, 16, 17, 28] Systematic reviews have attested that multidisciplinary team-based interventions reduce hospitalizations and mortality in heart-failure patients,[28, 29] reduce the risk of death or dependency in stroke patients,[30] and improve disease outcomes in patients with rheumatoid arthritis.[17] Not surprisingly, studies have shown that better-functioning teams – those displaying a high degree of collaboration, coordination, and positive communication – achieve better outcomes.[26] Multidisciplinary teams frequently involve some revision of roles in order to ensure that the skills of all members are put to optimal use, and to prevent service gaps and duplication.[14]

2.2.3. Task Transfer and Non-Physician Practitioners

Another type of role-redesign involves the transfer of functions from one healthcare professional (typically a physician) to another (such as a nurse or pharmacist) through the use of standing orders or other methods. **Although not every experiment with a new or expanded role has been a success, there is evidence that such initiatives can play an important part in improving chronic disease care**.[16, 17] An 81-study review of interventions to promote adult immunization and cancer screening found that education and reminders directed at either physicians or patients had only small effects.[31] **It proved much more effective to transfer**

[♦] For further discussion of the evidence in this area, see the concept paper *Watching Your Wait: Evidence-Informed Strategies to Reduce Healthcare Wait Times* (2007).

these tasks to nurses (other forms of delivery system redesign, such as planned visits, were also effective). Of course, changes to healthcare roles may involve much more than the delegation of specific tasks. There is growing recognition that the employment of non-physician practitioners (in particular, physician assistants, nurse practitioners, and clinical nurse specialists) can help the system care for more patients, more efficiently, without compromising the quality or safety of care.[32♦]

2.2.4. Case Management

A role often introduced as part of delivery system redesign is that of the case manager, who serves the patient as service coordinator or navigator and also provides self-management support. It is often suggested that, whereas most patients do not require such intensive involvement, patients with significant and complex service needs can benefit from case management.[2] Some American health maintenance organizations employ a "pyramid" model to stratify patients into three categories: Case management is reserved for those with the most complex, multidimensional needs; coordinated disease-management services are provided to a larger group of high-risk patients, and the remaining 70-90% receive self-management support. In practice, however, it can be difficult to determine which patients should receive case management. Often the decision is made on the basis of disease severity or service-utilization history, but neither of these has proven an outstanding predictor of future service use, nor a reliable indicator of the need for a case manager.[33, 34] This difficulty may explain why case management has generally fallen short of expectations. Systematic reviews have found moderate evidence that it can improve at least some patient outcomes, but weak evidence that it can reduce healthcare utilization and promote a more efficient system (more recent studies have also supported this conclusion).[8, 35-37] Among these studies, case management was operationalized in a variety of different ways, and directed at a variety of different populations in several different countries. Although the reviewers noted that the effectiveness of case management probably depends on its specific content and context, they did not find enough evidence to recommend any particular approach.[35]

EVIDENCE INTO ACTION

Evidence: Delivery System Redesign is the top priority in chronic disease management. Changing the system is more efficient than trying to change individual providers' behaviour.

Actions:

- Improve the scheduling and organization of care.
- Promote and expand advanced access (same-day appointments).
- Identify opportunities to increase the use of multi-disciplinary teams.
- Promote a greater role for non-physician practitioners
- Case management should be considered only if carefully targeted to patients least able to manage their own conditions.

A large Australian study shed light on the promise and pitfalls of case management.[37, 38] Eight regions implemented chronic-care reform projects, whose most salient feature was the introduction of service coordinators. These professionals (mostly nurses) assessed patients

♦ For further discussion of the evidence and issues surrounding non-physician practitioners, see the concept paper *Non-Physician Practitioners in the Canadian Context* (2007).

through a comprehensive Problems and Goals Interview, assembled information from other providers, and developed a care plan. Relative to control-group patients, participants in five of the eight projects showed improvements in quality of life; however, there was no overall change in service use. Overall, the regions achieved some cost savings on hospital admissions, but not enough to pay for the new interventions. Interviews with service coordinators and physicians suggested that, although there had been an attempt to recruit only high-need patients, many of the participants did not really need or benefit from the program. These staff members said they had observed major gains in about a quarter of the patients – specifically, individuals with several of the following: poorly controlled conditions, difficult living situations, lack of knowledge about their illness, depression, lifestyle risk factors, lack of motivation to change their behaviour, and lack of prior linkages to health and community services. **The authors concluded that "*coordination should be provided according to the patient's self-management capacity, not just the severity of his or her disease*"** (Battersby et al., 2007, p. 58).[37] The extent to which this important finding can be successfully applied in practice remains to be seen.

2.2.5. Models for Physician Compensation

A potentially important form of system redesign – which goes far beyond the area of chronic disease – involves the revision of funding models. The fee-for-service model by which most physicians are compensated has been identified as a barrier to certain important initiatives (e.g., team-based care, utilization of non-physician practitioners, provision of preventive services, etc.).[39-41] However, available evidence suggests that no funding model (e.g., salary, capitation, etc.) is without its problems, and there is growing support for flexible strategies and/or blended models.[39, 42, 43] Recently, many organizations have begun to experiment with pay-for-performance (P4P) schemes in which physicians receive financial incentives for meeting certain quality indicators.[44] However, the evidence in this area is still sparse,[45] and important concerns remain to be addressed (regarding, for instance, the extent to which financial incentives actually change behaviour,[42] the validity of measures used to assess performance,[45-47] and the potential unintended consequences of trying to quantify medical care.[46, 48] Although a full examination of the complex issue of funding models is beyond the scope of this paper, there appears to be a need for further research and evaluation, particularly in a Canadian context.[42, 49, 50]

2.3. Self-Management Support

The CCM component with the second-strongest evidence base is **self-management support**. The importance of self-management in chronic disease cannot be overestimated; after all, patients live with their illness "24/7" but spend only a fraction of their time in contact with healthcare providers.[3] The focus of self-management interventions may be narrow (medication adherence, symptom monitoring) or broad (physical and psychological components of healthy living). In either case, the challenge is to develop interventions that really work, and to deliver them to patients who really need them (i.e., who are not already managing their conditions well).

The architects of the CCM recognized that education alone does not suffice to change behaviour. Those individuals eager to make changes in response to health education will tend to have already picked up the brochure or accessed the information online. **Self-management support, in cases where it is needed, must entail helping patients acquire the skills, confidence, and**

resources to put health information to use. Unfortunately, "*many organizations believe[d] that they provided self-management support, assuming that it was a new jargon term for traditional, didactic classroom teaching or counseling*" (Wagner et al., 2001, p. 74).[2] Not surprisingly, those "self-management" interventions focusing primarily on patient education have had poor results.[23, 51]

Overall, the evidence suggests that self-management support promotes improvement in patient symptoms, although this may or may not hold true for all diseases.[9, 52] Many studies have also claimed that interventions to promote self-care are cost-effective; however, a systematic review suggested that most of the economic evaluations have been too seriously flawed to be conclusive.[53]

2.3.1. Professionally-Led and Lay-Led Programs

Although further evidence is needed, **studies have suggested that the most effective interventions are those provided by a healthcare professional and integrated into regular care**.[52, 54] In contrast, lay-led group programs have gained increasing prominence as a mode of providing self-management support. The major initiative in this area is the Chronic Disease Self-Management Program; developed at Stanford University, it is based on self-efficacy theory and designed to help people take an active role in managing their conditions. Based on the promising results of early US studies, an anglicized version called the Expert Patients Program was widely introduced in the UK.[54♦] However, despite the excitement that has surrounded such programs, a 2007 Cochrane Review found that, overall, results have been far more modest than expectations.[55] On the positive side, the programs did produce increases in self-efficacy, as well as in cognitive symptom-management and (self-reported) frequency of exercise. However, the average improvements in self-reported pain, fatigue, disability, and general health status were too small to be of clinical significance, and the studies did not yield consistent effects on physiological measures, quality of life, or healthcare utilization.

EVIDENCE INTO ACTION

Evidence: Self-management support is very important, but not all interventions are effective.

Actions:

- Avoid programs that focus on information/education alone. Make sure programs address something that patients lack and cannot easily acquire on their own (e.g., skills).
- Ensure that initiatives that are well-integrated into primary care; studies suggest that otherwise, they will have limited impact.
- Before expansion of lay-led programs, monitor and evaluate their impacts on health status, quality of life, and healthcare utilization, because evidence about such programs is mixed.
- Target interventions to those with the greatest need and to underserved populations; monitor who participates.

A recent mixed-methods study illustrated an example in which the Expert Patients Program promised more than it delivered. Quantitative analyses discovered that, although the program increased participants' self-efficacy and energy, it did not produce the hoped-for decrease in healthcare utilization.[56] In qualitative interviews, a small minority of participants indicated that their self-

♦ The Manitoba version is called Getting Better Together.

management had improved and, as a result, they now needed fewer health services. However, the majority "*did not appear to make the connection with the implicit messages…that they could reduce their need for medical care by changing their behaviour*" (Gately et al., 2007, p. 943).[57] The program failed to influence patients to change their well-established strategies for accessing and navigating health services; nor, as a community-run program, could it address any problems within the healthcare system that might be promoting inappropriate patterns of utilization. Thus, "*although the intervention was valued by most participants, increases in self-efficacy failed to produce the promised changes in self-management.*" (p. 943). In sum, the literature shows that, **although lay-led self-management programs have some benefits for patients, their impact seems much smaller than early reports implied**.[54]

2.3.2. Targeting Self-Management Support

A number of studies have highlighted the need to consider the extent to which self-management programs are reaching the right patients. Typically, programs directed at the more severely ill have larger effects.[54] Studies from the diabetes literature also suggest that **self-management interventions may be most likely to help socially disadvantaged patients, particularly those with low levels of education or literacy**.[58-60] Such persons may benefit from interventions to improve their health literacy (in terms of the knowledge and skills to manage medications, or to navigate through the healthcare system),[61] or from other supports that a sensitively delivered program can provide.[58] In one study, individually-tailored patient education and self-management support improved glycemic control for diabetic patients with low literacy, but not for those with high literacy.[60] There is even some evidence that lay-led self-management programs have more impact on physical symptoms when these programs are targeted towards underserved populations.[55] However, studies suggest that those patients most likely to benefit from self-management programs may be least likely to participate. Some have charged that health-enhancing programs typically attract the educated, middle-class "worried well".[62] The studies of lay-led self-management programs bear out this perception: Only a minority of eligible patients were willing to take part, most of the participants reported fairly good health to begin with, and for those programs that did not target underserved groups, many of the participants were highly educated and 90% were white.[55] (The programs also had difficulty reaching men; 70% of participants were female.) A systematic review of diabetes self-management interventions in disadvantaged populations found highly variable participation rates (median 68%), and attendance rates as low as 10% (median 60%).[58] Despite the fact that people with low SES face many barriers to attending group meetings (e.g., lack of transportation or childcare), nine of the ten studies relied on this method of delivery. To be accessible to the disadvantaged, programs should seek to remove practical barriers to participation, most obviously financial ones (even a fee that program directors consider nominal may be a significant deterrent to someone with low income;[63] what is more, adopting the behaviours encouraged by self-management programs can be an expensive proposition.)[53] However, greater accessibility is only part of the solution. Patients might find a program unattractive for a variety of reasons; for instance, they might perceive it as judgemental or insensitive to their life situations and experiences. To discover such potentially important information, it is valuable to solicit the perspectives of individuals who are *not* accessing the program. In a related example, one family planning centre wanted to know why low-income women were making little use of their services.[64] Focus groups uncovered several reasons, including mistaken beliefs about contraceptive methods and

negative past experiences with certain service providers, but the most common theme was that the women did not see the concept of "planning" as relevant and realistic. They described their relationship lives as unpredictable, and were unwilling to embark on long-term contraception "just in case." These findings came as a surprise to officials, who had assumed that low-income women were unaware of the centre or found it uninviting. By understanding their target population, programs can develop better strategies and relate to clients more effectively. Of course, some factors that may inhibit participation are not amenable to intervention by program planners. In this vein, it is often noted that programs aimed at individual patients are only one component of a strategy to improve the health of disadvantaged populations; policy and environmental-level interventions are also crucial.[58, 65]

The need for appropriate targeting is not unique to the area of self-management support; some delivery-system-redesign interventions are also better when targeted. One meta-analysis of disease management programs, including those that were team-based, nurse-based, and self-managed, concluded that **interventions directed towards sicker patients were more economically effective**.[66] (It also found that, while the programs were cost-effective overall, team-based interventions were the most cost-effective, and self-managed interventions the least so.) This evidence underscores the importance of ensuring that all interventions – except, of course, those that must apply to everyone (e.g., improvement of scheduling systems) – are reaching the patients most likely to gain from them.

2.4. Decision Support

Wagner's advocacy of **decision support** was a response to the well-established finding that physician practice is highly variable, and often inconsistent with clinical practice guidelines.[2, 67] The CCM uses a broad definition of decision support, including provider education, feedback, computerized or paper-based reminders, or any other intervention to promote guideline-based care. However, **although hundreds of studies have trialed various strategies to increase physicians' awareness and use of guidelines, the results have been inconsistent, and modest at best.** A systematic review[51] found that provider education, feedback, and reminders each improved the management of depression, a condition that often goes unrecognized and untreated. However, for chronic conditions other than depression, these strategies succeeded in only a minority of trials. Looking across healthcare areas, a 235-study meta-analysis concluded that decision support does change provider behaviour, but only by about 10%.[68] Even the most effective decision-support strategy (i.e., reminders) yielded outcomes ranging from -1% to +34% improvement, with a median of 14%. Contrary to expectations, multi-component interventions were not necessarily more effective than single interventions. Not surprisingly, changes of such low magnitude often fail to "trickle down" to the patient.[9, 16] In a systematic review of computerized

EVIDENCE INTO ACTION

Evidence: Overall, studies have found that decision support has only a modest effect on processes of care, and little or no effect on outcomes.

Actions:

- *Before* investing in a decision support program, ensure staff buy-in and willingness to change practice.
- Ensure appropriate evaluation.
- Don't expect major improvements to ensue from this method alone.

decision-support systems, 62 of 97 studies reported improved practitioner performance, but only 7 of 52 found improved patient outcomes.[69]

It is well known that, in order for decision support to affect clinicians' behaviour, it must be integrated into their workflow.[70, 71] However, accomplishing such integration often poses unforeseen challenges. For instance, administrators of one UK primary care practice thought that computerized prompts would make guidelines a natural part of physicians' workflow.[72] Unfortunately, physicians described the prompts as unhelpful and irritating, and did not alter their practice patterns. Far from making decision support a routine part of patient visits, many doctors entered the disease information after the patient had already left. Outside the area of primary care, a Winnipeg hospital had a similar experience with computerized decision-support devised to promote more appropriate use of diagnostic imaging.[73] Physicians complied with the request to enter their orders via computer, but accepted only 2% of the guideline advice, and cancelled less than 1% of all orders. Interviews revealed that the physicians did not find the advice useful, and, in fact, had typically made their decisions before they got to the computer. These two case studies illustrate the perils of technological "fixes" for human-factors problems. Persuading staff to enter data into a computer is not equivalent to persuading them to actually change the way they practice.

2.5. Clinical Information Systems

Similar observations can be made about **clinical information systems**. This CCM component is based on the sensible premise that a centralized registry of individuals with chronic disease could help providers keep track of all patients' conditions and needs. In some cases, such registries have indeed helped healthcare organizations provide better care.[12, 17] However, evidence indicates that improved data collection does not always result in improved practice, nor improved outcomes.[9] The literature on electronic health records (EHRs) reveals such a pattern. Early studies, involving four large, well-organized institutions with "home-grown" systems, sparked great enthusiasm about the potential of EHRs. However, when subsequent research assessed the situation at American medical practices in general, the results were more disappointing: On indicators of care quality, practices with EHRs scored no better than practices without.[74]

EVIDENCE INTO ACTION

Evidence: Research to date suggests that clinical information systems, in and of themselves, do not improve the processes or outcomes of chronic disease care.

Actions:

- Don't expect that clinical information systems, on their own, will improve care; evidence suggests otherwise.
- Only introduce them to support system-design changes that have already been implemented.
- Ensure that new systems are user-friendly and well-integrated with existing systems.

Although clinical information systems have many theoretical benefits,[42] the evidence reveals that they are no magic bullet: They are only as good as the system itself, its suitability for the context, its integration with other information systems, and its implementation in a way that facilitates rather than complicates clinicians' work.[71, 73, 75] When these criteria are not met, a new information system may have little effect except to provoke negative reactions from staff. (One qualitative study on the

unintended consequences of a new IT solution yielded the following gem from a healthcare administrator: "*A doc threw a computer at me!*"; Ash et al., 2007, p. 420.)[76] Integrated information-management systems with full functionality to support other initiatives are potentially most useful, but their development and implementation can be very expensive.[42]

2.6. Interventions in Healthcare Settings: A Brief Recap

Unlike the two remaining components of the CCM, the preceding four all comprise specific interventions to be implemented within healthcare settings. **The evidence suggests that decision-makers should make delivery-system redesign the first priority for change, followed by self-management support, and only then consider whether to add decision support and clinical information systems.** In fact, Wagner et al. (2001) predicted this conclusion, arguing that "*noninvasive system enhancements*" like guidelines and disease registries would achieve little "*unless preceded by fundamental changes to the design of practice and the provision of self-management support*" (p. 72).[2] They emphasized that "*effective chronic illness management requires comprehensive system changes that entail more than simply adding new features to an unchanged system focusing on acute care*." Unfortunately, many organizations follow the letter rather than the spirit of the CCM, choosing the interventions that require the least fundamental change. This theme emerged in an assessment of CCM implementation in 42 quality improvement collaboratives.[10] Although these organizations showed high fidelity to the model (all but one chose interventions in at least five of the six areas), they were less faithful to the evidence. For example, despite its importance, the promotion of team practice received less focus than almost any other intervention. Within the self-management domain, the most energy was put into patient education, and very little into patient activation and psychosocial support. The most common interventions were patient registries and decision-support prompts, neither of which has the most compelling evidence.

On the surface, interventions that are easiest to implement may seem most attractive. However, as we have seen, the ease of introducing a new piece of technology masks the difficulty of genuinely changing practice. **It is better to focus on a few fundamental, evidence-based system changes than to risk wasting resources on numerous weakly-supported interventions.**

2.7. Community Partnerships and Linkages

Within studies of the CCM, evidence for the importance of **community partnerships** is patchy and not very impressive.[9, 12, 13] However, this may be because the construct has been improperly defined. Wagner et al. (2001) spoke only of contracts between different healthcare services (redundant in Canada's public healthcare system) and referrals to preventive programs offered by community groups.[2] As the authors of the Expanded CCM have noted, this definition is far too narrow to reflect the many ways in which communities can contribute to health (or, for that matter, to illness).[5] In the second half of this paper, we will explore the elements that these authors added to the CCM (healthy public policy, supportive environments, and strengthened community action) in order to remedy this unbalanced perspective. For now, we will concentrate on one area in which linkages between healthcare and other programs have a proven track record of improving outcomes while reducing costs.

2.7.1. Integration Between Healthcare and Other Sectors

A group of McMaster University researchers have focused on "*more effective and less expensive community approaches*" to chronic illness care.[77, 78] Taking a community approach does not necessarily mean transplanting acute-care services into community settings; studies suggest that they may be no cheaper there, or may simply replace hospital costs with out-of-pocket costs to the patient (transportation, prescription drugs, etc.).[78] Rather, it means looking at the whole person and his/her life situation in order to prevent health crises or exacerbations that might precipitate an acute-care episode. Such care must attend not only to physical symptoms and their management, but to psychological and social factors (e.g., coping capacity, social support). Far from being unaffordable, services to meet people's non-health needs usually pay for themselves in reduced utilization of health services.[77, 78] There is evidence that high utilization of healthcare can stem from unmet needs in other areas.[34] **Controlled studies found that people who were *not* enrolled in programmatic (comprehensive) services "*used more medical services more often and with no better outcome, apparently drifting from less expensive health and social services to more expensive – but insured – medical services in an effort to relieve distress*"** (Watt et al., 1999, p. 380).[78] Of course, not every patient requires non-health services, and targeting is as important here as elsewhere.[79] However, better integration of health and social programs is vital so that all individuals enjoy free, timely access to the services they do require. Not only is this approach more client-centred, it also makes sound business sense, as "*the most expensive services are those that do not meet client needs*" (Watt et al., 1999, p. 384).

Evidence from the McMaster studies is consistent with what we know about the link between physical and mental illness. Depression frequently appears comorbidly with other chronic conditions, and is a risk factor for heart disease, cancer, and other illnesses.[80] Yet depression is more than just a disease to be tackled in a doctor's office – even an office where CCM interventions have facilitated efficient screening and assiduous medication management. Depression is often a reaction to stressful life conditions (including, of course, the stress of living with a chronic disease), and Prozac® is not always the best solution. Clients may need counselling to improve their coping, or practical assistance to remove certain stressors (such as a lack of employment or adequate housing). For individuals with severe mental illness, such a multidimensional approach is equally important – as demonstrated by the Program of Assertive Community Treatment (PACT), whose comprehensive services enable individuals who have spent years in a psychiatric hospital to live successfully in the community.[81] In contrast, a recent *Winnipeg Free Press* article revealed that 38 homeless persons utilized millions of dollars worth of emergency services – far more than it would cost to provide these individuals with housing and ongoing treatment for their mental-health and addiction problems.[82] Although

EVIDENCE INTO ACTION

Evidence: Better integration between healthcare and other programs can produce gains for patients and the health system.

Actions:

- Assess the extent to which unmet non-health needs lead certain patients to over-utilize health services.
- Through intersectoral collaboration, ensure that people receive the services that are the best fit for them.

further research is needed as to the best ways to achieve integration between different sectors, current evidence suggests that this is an important area to pursue.
A well-integrated system can ensure that all patients' medical, psychological, and social needs are recognized and addressed. Some of the necessary integration can be achieved within the healthcare system, through the services of mental health professionals, social workers, and community health workers.[24] Some will involve strengthening partnerships between health authorities and other programs. A number of current initiatives – from the move towards Winnipeg Integrated Services[♦] to the WRHA's provision of financial support to small community groups (e.g., seniors' meal programs) – are broadly consistent with the evidence that has been reviewed in this section. Finally, healthcare leaders can serve as advocates for other areas, such as housing, that often receive too little attention. Canadians typically see healthcare funding as sacrosanct, but may not recognize the profound impact that other types of public spending and policy have on health.[83] Unfortunately, as we have seen, people who slip through the social safety net typically wind up in the hospital. There is a need to raise the public's awareness that social spending is not in competition with health spending; on the contrary, often it *is* health spending (see section 3.6).[65]

2.8. Healthcare System Organization and Leadership

Healthcare organization and leadership is difficult to quantify and impossible to manipulate experimentally, which probably explains why there is little empirical evidence of its effect on chronic disease care. However, research has suggested that both organizational commitment and organizational culture are strong predictors of the success of any new venture.

2.8.1. Organizational Commitment

Leadership involvement is an important precondition for effective implementation of an improvement project.[84-86] The change-management literature highlights the importance for leaders, not only to declare support for an initiative, but to show that the initiative is a priority, and to ensure adequate time and resources for implementation.[87-89]

A controversial area, but one that may need to be addressed in order to implement the CCM, is the distribution of resources between acute care and other sectors. Primary care can help to prevent or forestall patients' need for acute care. Yet, in a political climate that promotes demands for immediate, dramatic impacts, primary care may see its pleas for funding denied, even when the amounts in question would seem trivial if requested by a hospital. The Manitoba Renal Program requires annual increases in funding to provide dialysis to the new patients who require this life-saving treatment. However, of the program's $58 million budget, only about 4% is provided to support prevention and early identification of kidney problems, which could avert the need for dialysis.[♦♦] Although the maxim "an ounce of prevention is worth a pound of cure" may not apply in every case,[90] fiscal decision-makers have a responsibility to consider long-term impacts, even in the face of pressure to focus on the short term.

[♦] An integration of health and social services – see <http://www.wrha.mb.ca/community/wis/index.php>.
[♦♦] D. Skwarchuk, personal communication, April 28, 2008.

2.8.2. Organizational Culture

The importance of healthcare culture is so widely recognized that it has almost become a cliché. Although campaigns to improve staff culture are unlikely to succeed,[91] leaders can certainly help to promote a positive culture through their own attitudes and practices. One model describes four types of organizational culture: *hierarchical* (which reflects values of stability and security), *rational* (reflecting values of efficiency and pragmatism), *group* (reflecting values of trust and belonging), and *developmental* (reflecting values of innovation and flexibility).[92] Healthcare organizations with more group-oriented and developmental cultures have been found more likely to successfully implement quality improvement.[93] In the area of chronic care, Hung et al. (2007) examined which primary care practices offered evidence-based preventive services. As hypothesized, practices that had CCM-recommended features (e.g., multi-specialty staff, use of decision support in the form of chart stickers and flow charts) were more likely to offer such services.[94] However, in a multiple regression analysis, no single feature showed a significant positive association with every type of preventive service – *except* the presence of a group/developmental culture. Leaders can foster a group culture by taking good care of staff and rewarding their loyalty, and a developmental culture by meeting new ideas with openness and encouragement, even when they challenge longstanding practices.

2.8.3. Evidence-Informed Implementation

Leadership (at all levels) is also responsible for crucial decisions about the process by which interventions will be chosen, designed, and implemented. In some ways, these processes are more important than the actual decision of which intervention to choose. In the health-services field, there are few bad interventions, but there are many interventions that fail to achieve their effects because they are implemented through ineffective strategies or in an inappropriate context.[21, 88]

The first step in choosing and implementing strategies is to set a clear overall direction, articulating the problem and specifying the types of solutions that should be pursued. To use an exaggerated example: One can guess the outcome when the message from leadership is simply, "This system is uncoordinated – everybody do something about it!" As discussed earlier, to implement the CCM all at once is an unrealistic goal.[11] **Although the CCM provides a useful framework for thinking about chronic care, research has shown that one component *can* be effective without the others, some interventions are better than others, and quality is more important than quantity**.[9] Once decision-makers have determined the high-priority interventions (based both on the strength of the research evidence and on regional needs, strategic priorities, and local context), they can offer individual programs and sites "*clear models and specifications about the desired end, as well as latitude in how they get there*" (Hroscikoski et al., 2007, p. 535).[11]

Evidence also suggests that initiatives are more successful when both their selection and their implementation are informed by staff perspectives.[95, 96] It is well-known that generating staff "buy-in" is an essential part of change management.[97] However, it is not always recognized that buy-in emerges from a two-way process in which decision-makers and staff learn from each

other, not a one-way process in which the former persuade the latter.[98, 99] It is also important for quality improvement efforts to work with physicians, not around them.[11, 100] In one study comparing the performance of primary-care practices on indicators of diabetes control,[101] the poorest performance was shown by practices in which all nurses, but not all physicians, were engaged in quality-improvement efforts. Meaningful consultation and involvement of patients and families can also promote better decisions and more effective action.[102, 103]

As the saying goes, "all improvement requires change, but not every change is an improvement." Evaluation of the changes that have been implemented, and removal of those that are not working, are integral parts of the improvement process. The perils of the alternative – that is, of layering one change on top of another, whether or not these changes have been evaluated as successful (or evaluated at all), adding with each successive change to staff workload and "change fatigue" – are readily apparent. (For a detailed discussion of evaluation, and how it differs from performance measurement, see Blalock, 1999).[104]

Some health organizations and regional authorities have used the Assessment of Chronic Illness Care[105] to monitor their progress towards implementing the CCM. Users score themselves on 3-6 items related to each CCM component, as well as 6 items related to integration of CCM components. Scores for each sub-section are averaged; these averages are then summed for a total score. This tool can help decision-makers identify potential areas for improvement; however, it has some limitations as a guide to action. In particular, its scoring system gives equal weight to every CCM component (and to each sub-item within every CCM component), whereas the evidence suggests that some activities are more beneficial and important than others. Moreover – as noted in the instructions for the ACIC itself – self-assessments are not always reliable. However, they can be helpful insofar as they are used to promote critical thinking about current practice.

EVIDENCE INTO ACTION

Evidence: Certain change-management strategies promote more successful implementation.

Actions:

- Focus; don't introduce too many changes at once.
- Ensure staff involvement and input
- Provide adequate time and resources for implementation.
- Evaluate both implementation and outcomes of new initiatives, and use the results to decide which interventions to continue.

A theme that often emerges from the quality improvement literature is the importance of not allowing the means to become the ends. Clearly, health authorities want to bridge the silos in the area of chronic disease without creating a new silo called chronic disease, disconnected from other areas. Healthcare organizations want to improve communication between providers without creating new protocols and positions that make the chain of communication even longer. Institutions want to increase efficiency without compelling staff to complete an ever-growing array of time-consuming forms and procedures. These examples illustrate the need to clearly distinguish between potential means of achieving a goal and the goal itself.[106]

By combining evidence-informed interventions with evidence-informed implementation, it is possible to create real improvement in chronic disease care. However, developing a better-functioning system of managing chronic illness is only half the solution; the other half involves

preventing people from becoming ill in the first place. Naturally, it can be difficult to determine the healthcare system's role in relation to the many factors that influence health. A greater understanding of these factors, and of potential strategies for addressing them, can help clarify where the healthcare system fits in.

3. THE EXPANDED CCM AND POPULATION HEALTH PROMOTION

The Expanded Chronic Care Model (CCM-E)[5] sought to integrate the CCM with a population health promotion perspective. It arose from the recognition that the CCM's approach to illness prevention was very narrow, focusing on specific preventive services that could be delivered in a clinic or community program. As the authors noted, "*the most significant determinants of health are social and economic factors, not those most strongly linked with healthcare services or personal choices and behaviours*" (p. 75). Therefore, a comprehensive approach to prevention must go beyond individual behaviour-change interventions to tackle the social determinants of health and empower communities to improve their own well-being. To replace the underdeveloped "community partnerships" component of the CCM, **the Expanded model offers three linked elements: building healthy public policy, creating supportive environments, and strengthening community action. These elements include certain activities that health authorities can undertake by themselves, some that require partnerships with governments or community groups, and others that call for healthcare professionals and leadership to take an advocacy role.** Through an integrated approach, the healthcare system can act most effectively to "*reduc[e] the burden of chronic disease, not just by reducing the impact on those who have a disease but also by supporting people and communities to be healthy*" (p. 76).

By considering the entire continuum of care, including upstream as well as downstream interventions, the CCM-E represents an important advance in thinking. However, as a guide to action, it is even less clear than its predecessor. Although the authors presented some evidence in support of various interventions, they did not attempt a systematic review or synthesis of the available evidence. In consequence, there remains a need to clarify which approaches to prevention and health promotion are most effective, which are less effective, and how decision-makers might set evidence-informed priorities in this complex area. This task is the aim of the rest of this paper.

In the field of population health promotion, not all topics lend themselves to a randomized controlled trial. The interventions that are easiest to study in a controlled way tend to be the small and specific ones, which may not be the most important or effective ones.[107] For this reason, this section will consider a broad base of evidence, including both intervention studies (and systematic reviews of such studies, where such exist), descriptive studies concerning the extent and probable sources of various threats to health, and various types of syntheses and reports.

It is useful to note that population health promotion itself represents an integration between the fields of health promotion and population health. Health promotion, as defined in the pioneering Ottawa Charter (1986), is "*the process of enabling people to increase control over, and to improve, their health*" (p. i).[108] It views health as "a state of complete physical, mental, and social well-being"; focuses on societal responsibility, not just individual behaviour; emphasizes

empowerment and public participation; and often targets its efforts towards disadvantaged communities.[109] Population health, in contrast, directs its efforts toward the whole population in order to "shift the population curve" on indicators of health and disease. Its underlying assumption is that, at the population level, producing small changes for many people can have greater impact than producing large changes for a few. This premise makes sense in theory; in practice, however, it is evident that (a) some sectors of the population have greater need than others, and (b) some interventions work for certain subgroups more than others.[110, 111] For the purpose of meeting population needs and reducing health disparities, it is widely believed that a balance between population-wide and targeted strategies is most appropriate.[109, 112] Some interventions clearly must apply to a whole population (e.g., smoke-free legislation), whereas others make more sense when targeted (e.g., interventions designed to reduce health disparities). The real question is not whether an intervention has a population-wide or targeted focus, but whether it is supported by evidence.

3.1. Lifestyle and Health Behaviour

For many people, "prevention of chronic disease" is synonymous with "prevention of unhealthy behaviour." As we will see, this equation is not accurate; unhealthy environments, as well as unhealthy behaviours, can bring about disease. However, since the area of (un)healthy behaviour receives so much attention and has generated so much research, it is a convenient place to start in our examination of the evidence. This section will focus on diet and physical activity. Tobacco use, the third member of the triad, has its own history and literature, which will be examined in a later section.♦

Extensive research has confirmed the importance of diet and physical activity in preventing and ameliorating chronic disease.[113] Cohort, case-control, and intervention studies have all shown that a healthy diet and regular exercise can prevent, mitigate, or reverse chronic diseases and pre-disease conditions, including coronary artery disease, hypertension, diabetes, metabolic syndrome, and cancer. The authors of a massive review in the *Journal of Applied Physiology* conclude, "*When daily physical activity of 1h is performed in combination with a natural food diet, high in fiber-containing fruits, vegetables, and whole grains, and naturally low in fat…the vast majority of chronic disease may be prevented*" (Roberts & Barnard, 2005, p. 4).[113] Of course, the difficult question is how to ensure that most people adopt such behaviours. As the authors recognized, many people doubt the feasibility of recommendations that North Americans get an hour of exercise and seven servings of fruit or vegetables each day – let alone that they forego refined and processed foods, or adopt the vegetarian or pesco-vegetarian diets that some studies have employed to dramatic effect. As we will see, there is considerable debate about the best way to change lifestyles.

In examining the role of diet and exercise in prevention, this paper consciously avoids the term "obesity." This is because, although obesity is clearly *correlated* with chronic disease, there is inadequate evidence that it actually *causes* chronic disease.[114-116] A causal mechanism has been demonstrated for a small number of chronic conditions (e.g., osteoarthritis, in which obesity puts a strain on joints). For others, however, obesity may simply be a marker for the unhealthy diet

♦ Other lifestyle risk factors, such as unsafe sex and alcohol abuse, are beyond the scope of this paper. Some of the general themes apply to these factors as well, although of course the details are different.

and lack of physical activity (and perhaps other factors, such as pre-existing metabolic dysfunction) that are known to cause disease. Several studies have found that the benefits of diet and exercise were independent of weight loss; participants who did and did not lose weight in the process enjoyed equal health gains.[113] Furthermore, concerns have been raised about the potential unintended consequences of the current emphasis on obesity.[115] For instance, it may promote the mistaken view of weight loss as a one-time achievement, when in fact, studies have shown that maintaining weight loss is difficult, and requires long-term changes in diet and exercise.[117-19] It may also contribute to the blaming and stigmatization of obese individuals.[114] Although the area remains controversial, focusing on diet and exercise appears to be a more evidence-informed approach than focusing on body mass or adiposity.

3.2. Interventions Directed Towards Individuals

3.2.1. Evidence for Individually-Focused Interventions

One type of intervention – which fits comfortably into the original CCM – seeks to promote behaviour change one patient at a time. **Such interventions have been shown to produce improvements, although not always large ones, in dietary and exercise behaviour.** A systematic review of dietary counselling found that low-intensity interventions (e.g., advice from a physician) typically produced small effects; medium-intensity interventions (e.g., mailings of targeted, computer-generated messages combined with a motivational phone call) had moderate effects, and high-intensity interventions (e.g., multiple counselling sessions delivered by a trained nutritionist) often produced sizeable changes in fruit, vegetable, and saturated-fat consumption.[120] However, as most of the high-intensity programs enrolled either high-risk or highly motivated participants, the results may not be generalizable to all patients.

EVIDENCE INTO ACTION

Evidence: Interventions directed at individuals are important, but their overall impact on population health is modest.

Actions:

- Do offer preventive care in individual or group settings.
- Target interventions to those with the greatest need (i.e., their reach must go beyond the "worried well").
- Ensure that interventions are accessible and attractive to members of underserved and "at-risk" populations, and monitor who participates.

Reviews show that exercise-related interventions – be they advice from a physician, exercise-referral schemes, or individualized communications to encourage walking – often produce moderate increases in physical activity, although the effects tend to drop off over time.[121-123] However, such interventions may have trouble reaching those who most need to exercise. Individuals who are sedentary and obese (as opposed to slightly active and only slightly overweight) are less likely to participate in an exercise class; similarly, patients who are smokers, less educated, and in poorer health are more likely to drop out of primary-care-based counseling.[121, 122] Programs that are tailored to participants' characteristics and preferences are more effective, but may still have difficulty ensuring high uptake and adherence.[121, 123] There is inadequate evidence as to the relative effectiveness of individualized and group-based programs.[123, 124.]

3.2.2. Limitations of Individually-Focused Interventions

It seems sensible to advocate that dietary or physical-activity counselling, or access to an exercise class, should be made available to individuals who desire them. **However, the effects of such interventions are typically modest at the individual level, and even less remarkable at the population level.** They are thus a very inefficient means of trying to change the population's dietary and exercise habits. As Lyons and Langille (2000) have pointed out, concentrating on individual lifestyle change misses the fact that lifestyles are, in fact, collective.[111] Our whole society has an unhealthy lifestyle – if it did not, we would not be seeing a dramatic increase in chronic disease. Interestingly, American research indicates that people are not eating fewer fruits and vegetables, nor devoting less time to sports and fitness activities, than they did two generations ago.[125] It is not, in fact, what we're *not* doing, but what we *are* doing – consuming more soft drinks and processed foods (full of fat and refined carbohydrates), snacking between already supersized meals, spending hours in front of the TV, making more trips by car, and leading a day-to-day life that calls for less and less physical activity – that is having such a deleterious effect on our health.[115, 125-127] In his provocative book *Fat Politics*, Oliver (2006) traces these developments even further back, to a consumer economy built around "*fulfilling our wants in as efficient and easy a manner as possible*" (p.10).[115] His analysis of America's "obesity epidemic" suggests that "*the most commonly accused culprits (fast-food, high fructose corn syrup, television, and automobiles) are merely accessories to the 'crime'; meanwhile, the real source of our growing weight (the free market) goes largely unnoticed*" (p. 13). As Oliver notes, our whole society is set up to encourage consumption and convenience, which is the antithesis of encouraging a healthy diet and physical activity.

Meanwhile, our ability to create more leisure time has not made most of our lives more leisurely. To a great extent, labour-saving devices have been used to enable us to work faster, not to work less. In a 2000 survey commissioned by the Heart and Stroke Foundation, more than half of Canadians reported that they were frequently stressed and had too little quality time.[128] A growing proportion of Canadians work overtime or cobble together hours from multiple part-time jobs; both overwork and instability of work hours are associated with higher stress.[129, 130] Small wonder if many people feel too frazzled to discover the joys of slow food, or too exhausted to take up any leisure activity more strenuous than "vegging out" in front of the TV. In recognition of these trends, public health bodies like the Centre for Disease Control have shifted from urging vigorous exercise to encouraging people to walk more in the course of their daily activities.[131] However, even this may be difficult to achieve. As George Orwell observed back in 1937, once a labour-saving machine or speedier method of transportation exists, it becomes highly inconvenient not to use it.[132] A harried employee is unlikely to embrace the practice of intentionally parking farther from work. Of course, some individuals do buck the trend, making the time for nutritious cooking and regular exercise; however, it is important to remember that they *are* bucking the trend. The key message is that the unhealthy behavioural patterns we see today are not the result of individual irresponsibility, nor ignorance of the healthful properties of exercise and fresh vegetables. They are the result of the way our society has developed. It is also important to keep in mind that members of disadvantaged groups face even more barriers to maintaining healthy lifestyles (see section 3.6.2).[111, 133]

None of this is to imply that collective lifestyles are impossible to change, nor that the health community should stop trying. However, **to combat so pervasive a problem, we need to understand why it is occurring, and to employ remedies that get as close to its roots as possible.** The following discussion will assess the main existing and potential strategies to improve population lifestyles.

3.3. Interventions Directed Towards the Public

3.3.1. Mass Media and Social Marketing Approaches

Public-health professionals' lives would be a lot easier if mass media appeals had the power to improve people's dietary and exercise habits. Unfortunately, the evidence reveals that they do not. **A 28-study systematic review concluded that mass-media campaigns to encourage physical activity were a universal disappointment:** People recalled the messages, but did not change their behaviour.[131] Similar results have been documented for mass-media campaigns to encourage other positive behaviours.[109] Dietary and exercise-related messages appear to be particularly ineffective among those of lower socioeconomic status (SES); thus, a focus on such strategies could potentially increase the health gap between high- and low-SES groups.[111, 135]

Obviously, such campaigns have been much less generously financed than corporate advertising of junk food and other vices.[127] However, this is surely not the only reason they failed; people clearly had had sufficient exposure to the messages to remember them – they just didn't act on them. It is important to recognize that, although media campaigns are typically launched under the banner of "social marketing," they are often far less sophisticated than what "real" marketers do. As Gordon et al. (2006) note, interventions that encompass only *promotion* without considering the other three elements of the "*marketing mix*" – product, price, and place – are "*social advertising, not social marketing*" (p. 1135).[136] Advertising can influence behaviour, but the effects it exerts by itself are smaller and subtler than many people realize.[137] Furthermore, corporations spend more money on market research (identifying market segments, conducting in-depth qualitative research on consumer needs and preferences, and developing and pre-testing images) than they do on advertising; health-related media initiatives often do not.[111♦] A systematic review found that, of 310 potentially eligible studies, only 35 small-scale initiatives met all the criteria for social marketing.[136] Such initiatives often produced (modest) increases in fruit and vegetable consumption, and several produced decreases in fat consumption, but the evidence was more equivocal for physical activity. It is not yet clear whether recent large-scale campaigns that employ improved marketing strategies have been more successful than their predecessors. What is clear is that health communicators, unlike corporate advertisers, often face the uphill battle of "*convinc[ing] people that giving up things they really like is good for them*" (Jeffery et al., 2001, p. 259).[126]

It appears that well-designed (i.e., extensively pre-tested and appropriately targeted) social marketing can play a valuable role in multi-component strategies to promote health.[109, 136] However, it is not unheard of for "multi-component" strategies to have, as their main ingredient,

♦ Consumer researchers in the health field must beware: People typically overstate the degree to which they are influenced by health-related and other prosocial messages, just as they understate the degree to which they are influenced by corporate advertising.[138]

the same kind of mass-media appeals that have been discredited as ineffective. Health promoters should therefore look critically at the evidence, and enlist the help of marketing professionals, before choosing an approach that involves mass media.

3.3.2. "Community-Based" Campaigns[♦]

In 1970, the residents of one Finnish county sent petitions demanding that the government address the high prevalence of heart disease in their community. The success of the ensuing North Karelia Risk Factor Reduction Trial (which included a mix of communication campaigns, educational programs, and policy changes) inspired health-promoters across the world to follow suit.[109] **However, these encores – including large-scale initiatives like the Minnesota Heart Health Program, Heartbeat Wales, and others – were a resounding failure, producing results that ranged from meagre to nonexistent**.[109, 126, 139] What went wrong?

The first clue is that, although imitators could replicate the content of the North Karelia trial, they could not replicate the context. Whereas the Finnish initiative sprouted from grassroots concern and agitation, subsequent programs were "*launched in response to the pre-conceived agendas of public health professionals*" (Hyndman, 1998, p. 22).[109] The attempt to mobilize community members around an issue that they never considered a priority can be an endless, thankless struggle.[140] The fact that "community-based" health initiatives are usually aimed at the residents of some geographic area, whether or not they see themselves as a community, cannot help.[112] Such programs do not even meet the Ottawa Charter definition of health promotion; they do not empower communities to achieve greater control over their health, but exhort them to help health professionals prevent disease.[141]

The second clue is that, whereas the North Karelia trial incorporated some policy initiatives (e.g., restrictions on smoking and on the availability of certain foods), its successors have relied on communication campaigns and promotional events.[109] They have overwhelmingly focused on personal health behaviours rather than on unhealthy features of people's environments,[112] or have combined individualistic messages with environmental modifications too small to make much difference (e.g., signposting walking trails).[131] Thus, despite the great degree of attention and fanfare these initiatives have received, they may simply be the old mass-media approach in disguise.

Like their mass-media cousins, top-down community-based campaigns have a dismal record with disadvantaged communities.[65] One four-year program implemented over 40 carefully tailored interventions in a low-income neighbourhood – to no effect.[142] The authors concluded that "*unless or until basic living needs are ensured, persons living in low-income circumstances will be unlikely or unable to view [cardiovascular disease] prevention as a priority*" (O'Loughlin et al., 1999, p. 1824). Of course, people can benefit from various programs and services that are based in the community (e.g., support groups, early childhood programs, etc.).[109, 143] However, enlisting the community to preach individual behaviour change has repeatedly failed to produce the desired results.

♦ Not to be confused with WRHA community-based services or various programs that are located in the community. The literature uses this term to refer to initiatives in which organizers target a certain community and seek to involve community members.

3.3.3. Community Development Approaches

In contrast to the approaches just described, *community development* – in which trained facilitators follow the community's lead in identifying problems and crafting solutions – has an encouraging record.[5, 109, 143-5♦] A review concluded that, although additional formal evaluation studies are needed, the best available evidence suggests that community development represents an effective approach to health promotion.[145] Initiatives ranging from Better Beginnings, Better Futures (in which residents got involved in a variety of activities to support children, families, and neighbourhoods)[143] to the Tenderloin Senior Organizing Project (which helped low-income seniors tackle shared issues from malnutrition to crime)[147] have fostered improved health as well as community cohesion and empowerment.[109] Such initiatives are in keeping with the CCM-E component "strengthen community action."[5] However, participatory approaches are not easy; meaningful community involvement requires time, resources, relationship-building, flexibility, and compromise.[148, 149] Even developers of valuable programs to address pressing local health needs will struggle to achieve community participation if residents' attention is on other social problems.[150] For this reason, organizers cannot insist on narrow definitions of what counts as a "health" issue; a focus on broader determinants of health (e.g., poverty, unemployment, or inadequate housing) may be more appropriate in some contexts.[150, 151] However, even when only a small group of community representatives involve themselves in health-related issues, their contributions to policy and programming can be highly valuable.[152]

3.4. Interventions Directed at Environments

Consistent with the CCM-E component "create supportive environments," the *healthy settings approach* maintains that all parts of a school, workplace, neighbourhood, or city should work together to enable people to be healthier.[107] This philosophy emphasizes mutually reinforcing changes to different aspects of the environment. Unfortunately, there is a tendency to confuse the settings approach with "health promotion in settings" (i.e., individualistic approaches that happen to be implemented within a school, workplace, etc.).[107] Research on interventions of the latter type has confirmed what we already know: Information and communication (including more interactive methods like health risk appraisals) do not suffice to change adults' behaviour.[153, 154] Schools can sometimes impact youth behaviour through health education, which has long been a part of the curriculum.[155] However, not only is there inconclusive evidence about the effectiveness of curriculum-only approaches,[156] but there is some limit to the amount of class time that can be spent on health promotion without neglecting other important subjects. Environmental interventions are therefore as important in schools as in other settings.

3.4.1. Interventions to Promote Healthy Diet

Although the healthcare system does not control policies within schools, the healthcare and education sectors frequently work in partnership to support health promotion; it is therefore valuable to review research about school-based interventions. Such research has made it clear

♦ In keeping with this literature, the WRHA Community Development Framework (2007) emphasizes the importance of a *locality development approach* in which the region helps "to catalyze and support local actions without controlling the process" (p. 30).[146]

that weak interventions (e.g., initiating a "healthy lunch contest," or adding a token "healthy choice" to an otherwise unhealthy menu) are ineffective. A more promising strategy involves removing junk food from school cafeterias and vending machines, and replacing it with healthier, tasty alternatives. Unhealthy food and drink are widely available in both American and Canadian schools; even elementary schools, which typically lack vending machines, may supply students' "sugar fix" through tuck shops and pervasive fundraisers.[157-9] These practices are difficult to justify from the perspective of student learning or well-being. Schools often hesitate to implement healthy-food policies for financial reasons – and it goes without saying that education funding must be adequate to ensure that schools need not rely on contracts with soft-drink manufacturers.[159] However, some schools have replaced unwholesome foods with creative alternatives (including fresh deli sandwiches, fajitas, and sushi) and actually increased lunch revenues.[160] Similarly, despite widespread concern that students who cannot obtain junk food in school will bring it from home or venture off campus to buy it, studies suggest that such compensatory behaviour has not occurred to the extent feared.[160, 161] (However, students *will* compensate if the soda that was removed from the cafeteria is still available in the vending machine.[161]) Pricing changes can also be effective; in a two-school study, selling baby carrots and fresh fruit for half price doubled the sale of carrots and quadrupled the sale of fruit while the promotion lasted.[162] Further research is needed to assess the relative effectiveness of various strategies, which may also include outright bans on certain foods, even when they are brought from home.[160] Evaluations should also be alert to any unintended consequences of food policies (e.g., a thriving black market in candy); however, anecdotal reports of students consuming junk food off campus would not seem sufficient grounds for retracting these policies.

A systematic review of worksite studies suggested that dietary interventions (typically along the lines of product labelling, or making more healthy foods available) can increase fruit and vegetable intake and decrease fat intake.[153] However, it is cause for concern that all these studies relied on self-report measures; people frequently overreport socially desirable behaviours and may be even more likely to do so when they know that their employer has implemented a health-promoting intervention.[153] On the other hand, pricing changes clearly influence employees as well as students. A study conducted in 12 workplaces and 12 secondary schools found that, when the price of lower-fat vending-machine snacks was reduced 10%, 25%, or 50%, the percentage sold increased by 9%, 39%, and 93% (monthly profits from the machines were unaffected).[162]

EVIDENCE INTO ACTION

Evidence: Interventions directed at environments are a high priority: Multiple, non-trivial environmental changes are necessary to promote the adoption of healthy lifestyles.

Actions:

- Focus on concrete changes that make healthy behaviours easier, cheaper, and more convenient.
- Don't just disseminate information within various environments – education campaigns and promotional events do not change the environment.
- Ensure that environmental changes are of sufficient number and strength to make a significant impact.
- Through policy advocacy and inter-sectoral collaboration, promote healthy urban environments.
- Model best practices by introducing tangible, evidence-informed environmental changes in healthcare workplaces.

Product labelling is among the weaker "environmental" interventions that have been pursued at the societal level. It is desirable that consumers have access to product information, and many report that they read it, but it is unclear how much it shapes purchasing decisions, especially those of low-SES shoppers.[135] Some American states appear to have achieved reductions in obesity by taxing junk food; however, since consumption taxes are regressive (i.e., they place a greater burden on the poor), they can best be justified if the revenues are used to subsidize healthy products.[163] As suggested by school and workplace studies, the best way to promote healthy foods may simply be to make them cheaper. When the Heart and Stroke Foundation asked baby boomers what would help them make lifestyle changes, cost-related policies topped the list.[164♦] As for curbing the consumption of unhealthy foods, the move towards banning trans fat is an important development to watch.[165] Although this strategy may or may not decrease overall intake of unhealthy fats, it can at least prevent people from ingesting much of one harmful substance, and send a message that the government is willing and able to regulate the food industry.

3.4.2. Interventions to Promote Physical Activity

By mandating physical education classes, schools can ensure that students get at least some exercise; however, strategies to increase physical activity outside of class time may have limited effectiveness, especially with girls.[166] Evidence about the extent to which various interventions can promote physical activity in the workplace and community is inconclusive. Building walking tracks or trails, or installing showers and change rooms at work, does not guarantee that people will use them, much less that overall activity levels will increase.[156] However, there is some evidence that the availability of more free, safe, and attractive places to exercise can increase the proportion of residents who are active.[131] Broader strategies appear to have bigger results. For instance, Minnesota, with its longstanding policy of promoting bicycle use through an extensive network of paths as well as safety programs, boasts a substantially higher-than-average cycling rate despite its less than perfect climate.[125] There is also a place for good, old-fashioned financial incentives; in one study, employees increased their active commuting after the employer began to subsidize non-car transportation.[123] However, when it comes to promoting active living, the most important place to look is probably urban design.[131, 167] In a systematic review of 20 studies, 17 found a significant association between some aspect of the built environment (e.g., urban sprawl, land use mix, access to recreational facilities, etc.) and obesity.[168] A more recent study clarified the roles of neighbourhood walkability and individual preferences.[169] Naturally, preferences made a big difference; people who did not prefer a walkable environment seldom walked. However, within each group (high *vs.* low preference for walkability), those who lived in walkable neighbourhoods walked more than twice as much as those who did not. Furthermore, regardless of their preferences, people tended to drive the least in walkable neighbourhoods. The cost and convenience of public transportation can also influence travel choices.[125, 131] Thus, whether policymakers' objective is to promote fitness or to discourage car travel, the departments of urban planning and transportation may have more impact than the department of healthy living. **There is a strong need for intersectoral collaboration to ensure that our cities and neighbourhoods are set up in a way that promotes health.**

♦ Some of the most widely endorsed survey items were phrased in terms of tax breaks; however, for low-income Canadians who pay minimal tax, subsidies would obviously have more impact.

Unfortunately, it can be difficult to generate the political will and momentum necessary to instigate fundamental changes, or even to avert further bus-fare hikes and urban sprawl.[167] It is also difficult to study major and pervasive changes in a controlled way, which is why many researchers have concentrated on minor interventions.[107, 156] They have discovered, for instance, that signs encouraging stair use can increase the proportion of stair-users from 6% to 14%[170] – a statistically significant increase, but trivial in the grand scheme of chronic disease prevention. There is nothing wrong with implementing such measures (they are certainly inexpensive) – as long as they are not construed as an adequate response to population health needs.

3.4.3. Challenges and Potential Actions

Despite the promise of environmental approaches, it must be kept in mind that a small change to one aspect of the environment is unlikely to have large effects. Further research is needed to fully understand the effects of different interventions in different contexts.[171] However, **there exists ample evidence that far-reaching changes are required, and reasonable evidence that certain changes are effective.**

Many environmental factors are outside the direct control of the healthcare system; healthcare leaders can best influence them through intersectoral collaboration and advocacy. **Additionally, the healthcare system can set a positive example by implementing best practices within its own workplaces.** Ideally, this would mean ensuring that (a) healthy foods are more easily available and less expensive than junk food,[153] (b) active commuting (including bus travel) is subsidized by the employer,[123] and (c) consideration is given to policy changes with the potential to reduce employee stress (e.g., flex-time,[172] reduced expectation of overtime,[173] minimization of interruptions[174]). As we have seen, tangible environmental changes have a much more significant impact on employee health than informational campaigns, contests, or promotional events. They should therefore be the priority in any effort to promote healthy workplaces. A commitment to such changes within our own organization can enhance our credibility as we seek to influence other environments.

3.5. What Can We Learn From Tobacco Control?

Trends in tobacco use, unlike those in diet and exercise, are encouraging: Over time, the proportion of Canadians who smoke has declined. The long and successful history of tobacco control may provide important clues as to how best to tackle other "lifestyle" factors. Of course, it is possible that tobacco control is simply an easier enterprise than diet or physical-activity control: It involves a specific substance and an easily defined end-point (i.e., total non-use of tobacco), whereas diet and physical activity involve many substances and behaviours, and categorical goals (e.g., total abstinence from unhealthy food and sedentary leisure) do not seem reasonable.[167] However, now that smoking prevalence is decreasing, it can be difficult to remember that tobacco control has not been an easy ride, that many current approaches seemed radical when first introduced, and that not every approach has worked.[175] **As our focus turns to diet and exercise, the extensive tobacco-control literature (which includes numerous international studies and over a dozen Cochrane reviews) may help us build on successes and avoid repeating mistakes.**

3.5.1. Interventions Directed Towards Individuals

There is strong evidence in support of a variety of strategies to help individual smokers quit – including nicotine replacement therapy, intensive counselling from a smoking-cessation specialist, group therapy, high-intensity behavioural programs for hospitalized patients, and targeted smoking-cessation programs for pregnant women; [124, 176-179] physician advice has a weaker effect on quitting.[180] However, such strategies reach only a fraction of the population, and may not work for all subgroups of smokers.[181]

3.5.2. Interventions Directed Towards the Public

Information about the health hazards of smoking made a noticeable impact when it first became available, and still causes a stir when introduced into a new country.[182] Graphic warnings on Canadian cigarette packages continue to increase public knowledge about the risks of tobacco use – and, one hopes, to make those risks more salient.[183] However, health education may have reached the point of diminishing returns. Although not everyone can identify all the toxic constituents of tobacco smoke and the maladies that accompany them, an overwhelming majority (> 85%) of Canadian smokers at all levels of income and education know that cigarettes cause lung cancer and heart disease.[184] This alone should be sufficient information, even for the minority who do not realize that cigarettes also cause stroke and impotence. Moreover, health-information campaigns would seem redundant in view of the fact that most adult smokers wish they had never started and report that society and their loved ones disapprove of smoking.[185]

Social marketing to discourage youth smoking has a mixed record, depending on who is doing the marketing. On the one hand, the American Legacy Foundation's "Truth" campaign, a highly sophisticated countermarketing effort taking aim at the tobacco industry's deceit and manipulation, has had an impact on youth smoking prevalence. Both an initial study and a three-year follow up showed that exposure to "Truth" ads was associated with an increase in anti-tobacco attitudes and beliefs.[186, 187] On the other hand, exposure to Philip Morris' "Think, Don't Smoke" campaign was not; in fact, teens exposed to these ads seemed to show more positive attitudes towards the tobacco industry. The difference? The "Truth" campaign was designed to work, using edgy youth models, shocking examples, gross-out humour, and the slogan "whadafxup" to construct a rebellious, streetwise, tobacco-free identity that would appeal to youth. The Philip Morris ads consisted of weak admonitions (i.e., patronizing directives to avoid smoking, with no dramatic portrayal of the consequences of smoking). Industry-developed campaigns – like Lorillard's gleefully built-to-fail "Tobacco is Whacko if You're a Teen" – may also convey the counterproductive message that smoking is for adults only. Obviously, the tobacco companies know what they're doing (to successfully dissuade teen smoking would be inconsistent with their aim of hooking their customers young);[175] fortunately, public health professionals are not fooled.

Community-based campaigns (such as the COMMIT trial) have had no greater effect on smoking than on diet or exercise.[188] "Quit and win" contests have helped some smokers; however, their overall population impact is low (less than 0.2% of smokers have quit on account of them), and deception levels are typically high.[189] There is weak evidence that either community-based or family-based interventions can prevent young people from taking up

smoking.[190, 191] Worksite-based studies have shown that, whereas therapy was just as effective if participants were recruited from the workplace as from anywhere else, employer-provided incentives, contests, and promotional campaigns were not effective.[192, 193] The only intervention that consistently showed effects across the entire workforce was a smoking ban.

Contrary to popular wisdom, school-based programs lack strong evidence: Only about half the existing studies have shown any effects; some very extensive, well-conducted studies have shown none; and even the apparently successful interventions often delay smoking rather than prevent it.[194, 195] This finding may be a reflection of the limitations of the "social influences" approach that most curriculum-based programs use. These programs represent increasingly sophisticated attempts to help students develop the skills and self-efficacy to "just say no". Although hailed as an advance over simple information-giving, this tactic often misfires because it is based on a simplistic understanding of how social influence affects smoking. As a longitudinal qualitative study illustrated, only preadolescents believe that "peer pressure" compels young people to smoke.[196] By age 13, teens realize that peer influence is far more subtle; youth smoking is more often an expression of voluntary conformity to the norms of a valued social group than a reaction to force or threat.♦ It should give educators pause that some of the biggest proponents of school-based prevention programs are tobacco companies.[198]

3.5.3. Policy and Environmental Interventions

By far, policy interventions have had the greatest impact on tobacco use. High taxes discourage smoking initiation and encourage quitting, especially among younger and lower-income Canadians, who are more sensitive to price.[182, 199] However, although the poor are more likely to quit in response to a tax increase, they are also more likely to smoke in the first place, so in practice, these taxes have a disproportionate impact on the poor.[200] Recognizing that the burden of excise taxes is particularly heavy for low-income smokers who find it difficult to quit, many have suggested that the revenues be channelled into cessation support for the disadvantaged.[201] Advertising bans have also shown an impact on smoking prevalence, as long as they are total bans (if they are partial, manufacturers simply shift from banned to non-banned media).[195] Likewise, banning smoking in public places is much more effective than relying on educational materials and warning signs.[202] Smoking bans have obvious benefits in terms of decreasing non-smokers' exposure to environmental tobacco smoke, but their effect on smokers is the subject of continued research. Some studies have found that workplace smoking bans reduce overall smoking, whereas others suggest that employees who cannot smoke at work will compensate by smoking more at home, perhaps exposing their children instead of their co-workers.[192] However, a recent international study found that, after a locality banned smoking in public places, smokers were more likely to voluntarily ban smoking in their homes.[203] This suggests that bans on smoking in public spaces, through their positive effect on social norms, can reduce smoking in private spaces as well. On the other hand, not every policy intervention has had equally impressive results. Laws prohibiting the sale of cigarettes to minors are an example of an ineffective approach, having shown no significant effect on either youth smoking prevalence or perceived ease of access to cigarettes.[204] Many retailers fail to comply with the laws, and even when they do, teens can easily obtain cigarettes from friends or family members.

♦ Teenagers also have a much more advanced and differentiated understanding of alcohol and drug use and abuse than school-based programs do, which may explain why these programs don't work.[197]

Restrictions on sales to minors may do little except to reinforce the image of smoking as a cool, "adult" behaviour.[205]

3.5.4. Implications for Other Areas of Health Promotion

Of course, the interventions that have worked for tobacco control cannot be automatically applied to other areas. Many of the details are different. For instance, graphic, frightening images may be better suited to preventing tobacco use than to promoting healthy eating.♦ Moreover, whereas the protection of non-smokers is a key rationale for smoking bans, no one ever became fat from secondhand calories. Despite these caveats, an intriguing pattern emerges from the tobacco control literature: **The tobacco-control strategies that are *most* similar to prevailing approaches in the areas of diet and exercise have been the *least* effective.** The strategies that worked have reflected a willingness to substantially alter the environment – and to recognize and confront corporate power – that is seldom seen in prevailing approaches to diet and exercise. In the latter areas, policy approaches are in their infancy,[206] there is a continued emphasis on community-wide campaigns, and educational messages typically avoid criticizing corporate practices (e.g., Canadians are encouraged to read nutrition labels, but not warned that certain foods that are loaded with fat or refined carbohydrates may be misleadingly advertised as healthy options). Clearly, there is a need for further research to illuminate how effective tobacco-control approaches can best be applied to other areas. However, we can already infer that health-promoters should avoid approaches that have proven too weak to make an impact on tobacco use.

As we look to the field of tobacco control for guidance in other areas, it is important to remember that tobacco control, itself, remains worthy of attention. For all its gains, tobacco control has eliminated only about half of the tobacco problem, and many previously effective measures may have reached their saturation point. [195] Advocates must continually develop new strategies, while also defending against retaliation from the tobacco industry.[207] Furthermore, whereas smoking may be disappearing from middle-class circles, tobacco control is not working nearly so well for the poor, who are least likely to quit or intend to quit, least likely to respond to cessation programs, and still dying of lung cancer at alarming rates.[181, 208, 209] To find out why, we need to examine the relationships between SES or social class, lifestyle, and health.

3.6. Interventions Directed at Broader Determinants of Health

The approaches described in this section address certain fundamental reasons why some people – and in particular, some *groups* of people – are less healthy than others. Before proceeding, we might ask whether the health community should really spend time considering factors that are outside the control of the healthcare system. The answer is: We should, and we have before. Early public-health professionals and epidemiologists focused squarely on poverty and adverse socioenvironmental conditions.[210, 211] The threat of tuberculosis was reduced through improvements in sanitation and housing, not via a "be TB free" campaign directed at individual

♦ Studies suggest that "scare tactics" work well when there is a clear, concrete action people can take to avert the threat, but not when they lack the self-efficacy to take action, or when the message conjures up associations that would spoil a pleasant activity (e.g., condom ads that emphasize death and disease tend to turn people off. [138] On the other hand, the popularity of the movie *Super-Size Me* suggests that there may be a place for "gross-out tactics."

behaviour. Over the years, the pendulum has swung back and forth between individualistic and social approaches;[211] the current emphasis on lifestyle is far from necessary or inevitable.

What can the healthcare system do with information about the social determinants of health? First, **planners can ensure that programs are designed and targeted appropriately to meet the needs of disadvantaged communities.** Evidence can inform decisions to monitor who is receiving and benefiting from services, to strengthen community partnerships, and to pursue community development. Moreover, understanding the barriers to health faced by particular groups makes it possible to design and deliver services that are more sensitive to clients' life experiences, and ultimately more effective.[133] Such understanding cannot come from the literature alone; it is also important to engage members of marginalized communities and integrate their perspectives into decision-making.

Also, as is increasingly being recognized, healthcare leaders must play a role in **educating policymakers and the public** about the often-overlooked determinants of health.[5, 65, 109] Research has suggested that media advocacy can help to build public awareness and support for policies addressing the socioenvironmental roots of health and illness.[109] Who better to undertake this challenge than the healthcare community, which includes two of the most trusted professions – doctors and nurses? **Sending a clear message that we need *both* strong healthcare services *and* policies to address the social determinants of health could be a valuable part of a chronic disease strategy.** By recognizing that a policy need not be explicitly health-related to be profoundly healthy or unhealthy, healthcare leaders can make a significant contribution to the CCM-E component "build healthy public policy."

The following section will outline the evidence concerning both social and environmental determinants of health. It will also suggest effective actions that the healthcare system can undertake (either alone or through intersectoral collaboration) or support through advocacy.

3.6.1. Understanding the Social Determinants of Health

The term *social determinants of health* (SDOH) refers to the non-medical, non-behavioural factors that affect health and disease.[65] Although the term encompasses multiple variables (e.g., income, education, Aboriginal status, etc.) with complex, interacting effects, the basic, underlying issue is simple: The "haves" are healthier than the "have-nots".[212, 213] There is abundant evidence that low income – whether measured at the individual or neighbourhood level - predicts morbidity and mortality.[214-16] **Low-SES Canadians report poorer health status; require more healthcare for many conditions (including diabetes, coronary heart disease, COPD, and others); and incur much higher healthcare costs – which suggests that when it comes to poverty, governments have the choice to "pay now or pay later."**[217-19] Socioeconomic differentials in mortality also persist; in urban Canada, although the SES gap in *overall* mortality is narrowing, the gap for certain causes of death – including diabetes, lung cancer in females, mental disorders, and infectious diseases – keeps widening.[209]

Extensive research has established a causal relationship running from poverty to illness.[215, 220] The major mediators appear to be material deprivation, social exclusion, and the psychological stress that these engender.[65, 213] For instance, the poor are more likely to live in inadequate

housing (e.g., damp, mouldy, poorly ventilated, etc.), which promotes an array of infectious as well as chronic diseases, asthma being the most obvious example.[210] As well, poverty-related stress, depression, and feelings of hopelessness can promote illness: Through neuroendocrine mechanisms, such psychological factors increase the risk of virtually every disease.[80, 221]

3.6.2. Social Determinants and Lifestyle Behaviour

In addition to their direct impact on health, the SDOH also affect health indirectly through lifestyle. Behavioural risk factors are one of the few things that disadvantaged groups have in abundance. Not only smoking, but physical inactivity and poor diet (i.e., underconsumption of fruits/vegetables and overconsumption of high-calorie, nutrient-poor foods) are disproportionately prevalent among low-SES groups.[217, 222-4]

One obvious explanation is that the poor are more restricted than the rich in their opportunities to make healthy lifestyle "choices".[133] High-nutrient, low-energy-density (low-calorie) foods like fruits and vegetables are relatively expensive.[225] Such foods actually account for a similar proportion of the grocery budget in both high- and low-income households, but this translates into fewer servings for low-income families.[135] Nutritious foods are less available, and even more expensive, in low-income neighbourhoods.[217] Disadvantaged neighbourhoods also tend to lack safe places to exercise – and for their residents, purchasing a gym membership is seldom an option.[133] Cigarettes, of course, are not cheap, but neither is nicotine replacement therapy, which can help smokers overcome their addiction.[208] There is some evidence that nicotine replacement therapy is more effective when it is provided free of charge; presumably, when people do not have to pay for the treatment, they are more likely to stick with it long enough to break the habit.[226]

However, although financial and material barriers are an important reason why the poor have "poorer" lifestyles, they cannot be the only one. Some healthy foods (e.g., beans, brown rice, root vegetables) are not expensive, and although soda can be cheaper than milk in some parts of Canada, it is never cheaper than water. It is possible to get more exercise even when one's recreational opportunities are limited, and the high cost of nicotine replacement therapy does not explain why poor people start smoking in the first place. To understand such behaviour, it is necessary to understand the life circumstances from which it emerges, circumstances "*in which high stress and boredom [are] ever-present facts of life*" (Bancroft et al., 2003, p. 1267).[227] The stresses of poverty – material deprivation, economic insecurity, unemployment or working conditions that are physically or psychologically toxic, inability to participate in common societal activities – often compounded by the stresses of prejudice and discrimination, promote feelings of depression, hopelessness, and lack of control.[111, 133, 134] People with (well-founded) doubts that they can improve their lives are less likely to take health-promotion advice seriously, and more likely to reach for a cigarette or aptly named "comfort food" to relieve anxiety. Of course, the wealthy also experience stress, but they have more opportunities for healthy means of relief, and can opt for healthier convenience foods and more wholesome restaurants when they are tired or busy. In contrast, as a qualitative study suggested, the time and energy demands upon low-wage parents can be a major barrier to their making healthy food choices.[228] These parents (especially mothers) knew they were not feeding their children well and felt guilty about it, but explained that between work and other responsibilities, there was barely enough time to

eat, let alone to cook. When the only luxuries a family can afford are edible, treats become the main means of celebrating family time, indulging children, and joining the rest of our culture in conspicuous consumption.[132, 228, 229] The tendency for people living in poverty to spend their money on nutrient-poor processed products appears to date back as far as the products themselves. During the Depression, Orwell (1937) observed how the strain of poverty and unemployment led families to spend their meagre food budget on "*cheap luxuries*" like sugar and white bread (pp. 83-88).[132]

The above findings and insights illuminate why educational and promotional approaches have had limited impact with disadvantaged populations. As Lyons and Langille (2000) pointed out, "*People maintain lifestyles which they know are unhealthy because they meet certain immediate needs*" (p. 21).[111] More promising are interventions to make healthy foods and exercise opportunities more affordable and accessible.[135] One study involving low-income women compared the effects of nutritional education and coupons for a local farmer's market.[230] Whereas the education affected self-reported attitudes but not behaviour, the financial support led many women to buy and consume more fresh produce. However, although initiatives to reduce the cost of a healthy lifestyle are to be welcomed, they may only treat the symptoms of a much larger problem. The fundamental reason why the poor have unhealthier lifestyles may have little to do with foods and exercise opportunities themselves, and everything to do with poverty.

EVIDENCE INTO ACTION

Evidence: Changes within the healthcare system, important as they are, are not sufficient to relieve the burden of chronic disease. Policy and structural interventions that address the social determinants of health are equally crucial.

Actions:

- Actively pursue advocacy and advisory roles to ensure that evidence about the social and environmental determinants of health is reflected in public policy.
- Through intersectoral collaboration, tackle social factors that promote illness (e.g., poverty, lack of adequate housing).
- Use information about health disparities to design and target health services more effectively.

3.6.3. Getting to the Root of the Problem

There is evidence that services to alleviate the effects of poverty have positive effects on physical and mental health.[143, 231♦] However, attempting to provide individualized supports for every needy person would be much less efficient than enacting policies to reduce poverty overall.[134] Furthermore, some individual interventions simply would not work if applied to every individual; for example, if housing vouchers[232] were issued to every family in a low-income neighbourhood, they would all wind up competing for the handful of slightly-better spaces in better neighbourhoods, and few would end up better off. A more far-sighted plan would involve creating an adequate supply of good-quality, subsidized housing in mixed-income neighbourhoods.[214] Of course, some particularly high-needs individuals will naturally require more intensive support (see section 2.7.1). However, when the root problem is that large numbers of people live in poverty, what is needed is an overall policy approach that speaks to poverty in general.

♦ In contrast, punitive programs seeking to force welfare recipients into the labour market have not shown benefits in terms of either poverty or health.[143]

As several Canadian reports have illustrated, policies that attack poverty – not policies that attack the poor, or that focus only on the symptoms of poverty – are critical to reducing the burden of chronic disease.[134, 143, 213, 214] The most obvious way to reduce poverty is to raise income levels (through increases in minimum wage, social assistance rates, and government benefits, and/or a guaranteed annual income).[134, 143] Policies that improve people's living conditions and life chances are also essential; public spending on job creation, housing, education, social services, and "public goods" that all residents are free to enjoy (from universal childcare to community centres to health services that are not currently insured) can mitigate the adverse effects of low income.[134, 214]

3.6.4. Health Disparities and Diversity

Whereas the preceding section has focused on SES as a fundamental determinant of health, other SDOH are also highly relevant to health-services planning. For example, there are marked disparities between First Nations and the general population in terms of health status,[233] chronic disease (e.g., diabetes),[234] behavioural risk factors,[235, 236] and healthcare use (Aboriginal people appear to under-utilize health services).[233] These findings imply a need to improve access to care, to monitor the extent of Aboriginal participation in self-management and prevention programs, and to ensure that programs are culturally appropriate and acceptable to Aboriginal patients. As another example, understanding how language and informational barriers impede new immigrants' access to screening and preventive services can be a first step towards improving participation rates.[237-9] Local data about where health disparities exist can help to guide planners' focus as they seek to ensure equal care for all.[240]

3.6.5. Environmental Determinants of Health

The area of environmental health, of increasing concern to the public, is one in which the healthcare community can play an important advisory and advocacy role. Environmental pollution is clearly linked to respiratory health: A Toronto study estimated that in 2004, traffic-related air pollution was responsible for 440 deaths, 1700 hospitalizations, and thousands of acute-symptom and reduced-activity days for individuals suffering from asthma and other respiratory conditions.[241] A number of studies have suggested that pesticide exposure may adversely affect the immune system; however, this area remains controversial, and further epidemiologic studies are needed.[242] Chronic disease may be a key focus of future research: Recent studies have discovered higher blood concentrations of persistent organic pollutants (POPs, often found in pesticides) in people with diabetes or pre-diabetic conditions such as insulin resistance, and in women with cardiovascular disease.[243-7] There is also a small but growing literature on the associations between various environmental and occupational exposures (not limited to pesticides) and autoimmune diseases such as lupus, rheumatoid arthritis, and multiple sclerosis.[248, 249] In assessing the hazards of a substance, it must be kept in mind that a certain degree of exposure may be safe for a healthy person, but toxic for a person with pre-existing illness.[242] As a growing proportion of our population succumbs to chronic disease, it is increasingly important to reduce the risk factors for additional illness and for exacerbation of symptoms. For this reason, it makes sense for public health professionals to advocate the *precautionary principle*: "*When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect*

relationships are not fully established scientifically."[250] Although further research is needed to clarify the role that environmental exposures may play in chronic disease, there are good grounds for health professionals to advocate in favour of policies that protect and improve the environment, and against policies that threaten it.

4. CONCLUSION

Our journey through the evidence has shown how interventions at many levels – from enhanced services for individual patients, to improved organization of the delivery system, to broader environmental and policy changes – can play an important role in chronic disease management and prevention. A big-picture view, as reflected in the CCM and CCM-E, can help decision-makers develop an overall plan, identify potential opportunities for action, and ensure that important domains are not neglected. However, seeing the whole does not imply working on all of the parts simultaneously. **Research suggests that organizations are more likely to succeed by focusing on one important change at a time than by trying to implement many changes at once**.[9, 11, 251] Accordingly, it is necessary to use the evidence to set priorities for action.

The purpose of this paper has been to **compare the *strength* of the evidence base for different interventions.** Many interventions are claimed to be evidence-based on the strength of a few promising studies. However, further research may reveal that the intervention's effects are much weaker, or more conditional, than initially thought. For this reason, it is essential to review the evidence for as many alternatives as possible before choosing a course of action. In fact, experience suggests that the earlier evidence is used in the decision-making process, the more useful it becomes. The literature is often unable to provide much guidance on specific operational details; however, it can strongly suggest answers to fundamental questions about which approach to choose. It is also important to consider context (an intervention that works well in one country or system may or may not work well in another), and to evaluate initiatives that are new to the region. Finally, evidence in both the chronic-disease area and others highlights the need to **concentrate on underlying causes in order to address issues at the most appropriate level(s).**[14, 78, 210, 252]

The information that has been synthesized in this paper suggests the following top-priority areas:

1. **Start with a focus on delivery system redesign, particularly on actions that have proven most effective across a number of settings.** The most important of these appears to be advanced access, followed by other means of improving the scheduling and organization of care. Redesign and reorganization of healthcare roles to better fit the realities of chronic disease management also have strong potential to improve care. Initiatives to create effective multidisciplinary teams are an important focus of attention.

2. **Then, consider ways to expand and improve self-management support, but ensure that the design of initiatives reflects the best available evidence.** Studies have suggested that effective self-management programs (a) do not provide education and counselling alone, but help patients develop the self-management skills that they lack; (b) are well-integrated into primary care; and (c) are targeted to patients with the least capacity to manage their conditions.

3. **Actively pursue opportunities for collaboration with other sectors, and with community organizations, to tackle the unmet non-health needs that are leading certain patients to over-utilize health services.** Research suggests that such an integrated approach can improve client outcomes while reducing costs.

The table on page 36 provides a high-level synthesis of the evidence presented in this paper. Interventions listed in the first column ("definitely important") have a strong evidence base; in these areas, current initiatives should be strengthened and new initiatives undertaken. Interventions listed in the second column ("potentially important") have some supportive evidence, but either (a) there is inadequate evidence to draw strong conclusions, or (b) their effects appear to be smaller, more conditional, or more difficult to achieve than those of the first column. In these areas, it is important to monitor and evaluate current initiatives to ensure that they are achieving the desired outcomes. New initiatives in these areas may be valuable but would not be a top priority, and should be undertaken only after a careful look at the evidence. Interventions listed in the third column ("less important") have the weakest evidence base. Within the category of chronic disease management, the "less important" interventions can be effective in some contexts, but are unlikely to have much impact until the more important interventions are in place.[2] They should therefore be seen as a potential area for future action more than for current action. Existing initiatives should be carefully evaluated, and should not be expanded until they have been shown to achieve their objectives. Within the category of chronic disease prevention and health promotion, the "less important" interventions have a very poor record of effectiveness. Resources should be directed away from such interventions and towards those in the other two columns.

To make the best use of the knowledge that has been gathered in this review, the following next steps are suggested:

Step 1. Using the evidence outlined here as a guide, undertake a high-level environmental scan of regional chronic-disease-related activities, identifying current strengths, gaps, and areas for improvement.

Step 2. Establish processes to support evidence-informed priority-setting strategies for funding new chronic disease initiatives. Assess whether new requests are consistent with the evidence of what is most important for the region to pursue. At the same time, seek creative ways of redirecting existing support to the most effective strategies.

Step 3. Review ways in which the organization can support necessary changes that are beyond its mandate (e.g., modeling the evidence in WRHA organizational practices, exploring opportunities to raise public awareness of broader health issues, etc.).

CHRONIC DISEASE: WHAT'S THE EVIDENCE?

	Most Impact	Potential Impact	Less Impact
Chronic Disease Management	Delivery System Redesign • Advanced access • Multidisciplinary teams • Non-physician practitioners • Improving the scheduling and location of care Self-Management Support • Integrated into primary care Community Partnerships • Linkages between health and social services Health System Leadership • Strategic priority-setting • Staff engagement and input • Evaluation of new initiatives	Delivery System Redesign • Case management Self-Management Support • Lay-led programs Community Partnerships • Linkages to specific programs (e.g., exercise) offered within the community.	Decision Support Clinical Information Systems (in the absence of Delivery System Redesign) *Interventions in these areas should not be introduced until there have been major changes in other areas of the CCM.*
Chronic Disease Prevention and Health Promotion	Interventions Directed at Environments • Support policies that make healthy choices more convenient and affordable • Support restrictions on unhealthy products Interventions Directed at the Public • Community development initiatives emerging from residents' priorities Addressing Broader Determinants • Advocate healthy economic, social, environmental policy	Interventions Directed at Environments • Promote healthy workplace and school environments through tangible changes. Interventions Directed at the Public • Well-researched, well-designed social marketing Interventions Directed at Individuals • Evidence-informed individual counselling and/or group programs	Interventions Directed at Environments • Workplace promotional campaigns, contests, etc. • School-based interventions with minimal environmental component Interventions Directed at the Public • Mass media appeals • Community-based campaigns, initiated by health professionals, to encourage healthy lifestyles.

5. REFERENCES

1. Clare A. Chronic disease in the Winnipeg Health Region: A report using Canadian Community Health Survey data, Cycle 3.1. Winnipeg: WRHA; 2007.
2. Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. Health.Aff. 2001 Nov-Dec;20(6):64-78.
3. Department of Health. Chronic disease management: a compendium of information. London: DH; 2004. Available at: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_062820. Accessed March 11, 2008.
4. WRHA Chronic Disease Framework. Winnipeg Regional Health Authority; 2007.
5. Barr VJ, Robinson S, Marin-Link B, Underhill L, Dotts A, Ravensdale D, et al. The expanded Chronic Care Model: an integration of concepts and strategies from population health promotion and the Chronic Care Model. Hosp.Q. 2003;7(1):73-82.
6. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. JAMA 2002 Oct 9;288(14):1775-1779.
7. Singh D, Ham C. Improving care for people with long-term conditions. Birmingham, UK: NHS Institute for Innovation and Improvement; 2006. Available at: http://www.hsmc.bham.ac.uk/news/ReviewIntFrameworks-ltc.pdf. Accessed March 11, 2008.
8. McDonald KM, Sundaram V, Bravata DM, Lewis R, Lin N, et al.. Closing the quality gap: A critical analysis of quality improvement strategies: Volume 7 - Care coordination. Rockville, MD: Agency for Healthcare Research and Quality; 2007. Available at: http://www.ahrq.gov/downloads/pub/evidence/pdf/caregap/caregap.pdf. Accessed March 11, 2008.
9. Tsai AC, Morton SC, Mangione CM, Keeler EB. A meta-analysis of interventions to improve care for chronic illnesses. Am.J.Manag.Care 2005 Aug;11(8):478-488.
10. Pearson ML, Wu S, Schaefer J, Bonomi AE, Shortell SM, Mendel PJ, et al. Assessing the implementation of the chronic care model in quality improvement collaboratives. Health Serv.Res. 2005 Aug;40(4):978-996.
11. Hroscikoski MC, Solberg LI, Sperl-Hillen JM, Harper PG, McGrail MP, Crabtree BF. Challenges of change: a qualitative study of chronic care model implementation. Ann.Fam.Med. 2006 Jul-Aug;4(4):317-326.
12. Solberg LI, Crain AL, Sperl-Hillen JM, Hroscikoski MC, Engebretson KI, O'Connor PJ. Care quality and implementation of the chronic care model: a quantitative study. Ann.Fam.Med. 2006 Jul-Aug;4(4):310-316.
13. Sperl-Hillen JM, Solberg LI, Hroscikoski MC, Crain AL, Engebretson KI, O'Connor PJ. Do all components of the chronic care model contribute equally to quality improvement? Jt.Comm.J.Qual.Saf. 2004 Jun;30(6):303-309.
14. Kreindler SA. Watching your wait: evidence-informed strategies for reducing health care wait times. Qual.Manag.Health Care 2008 Apr-Jun;17(2):128-135.
15. Rachlis MM. Public Solutions to Health Care Wait Lists. Ottawa: Canadian Centre for Policy Alternatives; 2005. Available at: http://www.policyalternatives.ca/documents/National_Office_Pubs/2005/Health_Care_Waitlists.pdf. Accessed November 22, 2006.
16. Renders CM, Valk GD, Griffin S, Wagner EH, Eijk JT, Assendelft WJ. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. Cochrane Database Syst.Rev. 2001;(1)(1):CD001481.
17. Wensing M, Wollersheim H, Grol R. Organizational interventions to implement improvements in patient care: a structured review of reviews. Implement Sci. 2006 Feb 22;1:2.
18. Belardi FG, Weir S, Craig FW. A controlled trial of an advanced access appointment system in a residency family medicine center. Fam.Med. 2004 May;36(5):341-345.
19. Dixon S, Sampson FC, O'Cathain A, Pickin M. Advanced access: more than just GP waiting times? Fam.Pract. 2006 Apr;23(2):233-239.
20. Murray M, Berwick DM. Advanced access: reducing waiting and delays in primary care. JAMA 2003 Feb 26;289(8):1035-1040.
21. Murray M, Bodenheimer T, Rittenhouse D, Grumbach K. Improving timely access to primary care: case studies of the advanced access model. JAMA 2003 Feb 26;289(8):1042-1046.
22. Newman ED, Harrington TM, Olenginski TP, Perruquet JL, McKinley K. "The rheumatologist can see you now": Successful implementation of an advanced access model in a rheumatology practice. Arthritis Rheum. 2004 Apr 15;51(2):253-257.

23. Adams SG, Smith PK, Allan PF, Anzueto A, Pugh JA, Cornell JE. Systematic review of the chronic care model in chronic obstructive pulmonary disease prevention and management. Arch.Intern.Med. 2007 Mar 26;167(6):551-561.
24. Ontario Health Quality Council. 2007 report on Ontario's health system. Toronto, ON: OHQC; 2007.
25. Murray E, Burns J, See TS, Lai R, Nazareth I. Interactive Health Communication Applications for people with chronic disease. Cochrane Database Syst.Rev. 2005 Oct 19;(4)(4):CD004274.
26. Lemieux-Charles L, McGuire WL. What do we know about health care team effectiveness? A review of the literature. Med.Care Res.Rev. 2006 Jun;63(3):263-300.
27. Oandasan I, Baker GR, Barker K, Bosco C, D'Amour D, Jones L, et al. Teamwork in Healthcare: Promoting Effective Teamwork in Healthcare in Canada. Ottawa, ON: Canadian Health Services Research Foundation; 2006.
28. McAlister FA, Lawson FM, Teo KK, Armstrong PW. Randomised trials of secondary prevention programmes in coronary heart disease: systematic review. BMJ 2001 Oct 27;323(7319):957-962.
29. Philbin EF. Comprehensive multidisciplinary programs for the management of patients with congestive heart failure. J Gen Intern Med 1999;14:130–5.
30. Langhorne P, Taylor G, Murray G, Dennis M, Anderson C, Bautz-Holter E, et al. Early supported discharge services for stroke patients: a meta-analysis of individual patients' data. Lancet 2005;365(9458):501-6.
31. Stone EG, Morton SC, Hulscher ME, Maglione MA, Roth EA, Grimshaw JM, et al. Interventions that increase use of adult immunization and cancer screening services: a meta-analysis. Ann.Intern.Med. 2002 May 7;136(9):641-651.
32. Kreindler S. Non-physician practitioners in the Canadian context (concept paper). Winnipeg Regional Health Authority; 2007.
33. Roland M, Dusheiko M, Gravelle H, Parker S. Follow up of people aged 65 and over with a history of emergency admissions: analysis of routine admission data. BMJ 2005 Feb 5;330(7486):289-292.
34. Browne GB, Arpin K, Corey P, Fitch M, Gafni A. Individual correlates of health service utilization and the cost of poor adjustment to chronic illness. Med.Care 1990 Jan;28(1):43-58.
35. Hutt R, Rosen R, McCauley J. Case-managing long-term conditions: What impacts does it have in the treatment of older people? London: King's Fund; 2004. Available at: http://www.kingsfund.org.uk/publications/kings_fund_publications/case_managing.html. Accessed March 11, 2008.
36. Gravelle H, Dusheiko M, Sheaff R, Sargent P, Boaden R, Pickard S, et al. Impact of case management (Evercare) on frail elderly patients: controlled before and after analysis of quantitative outcome data. BMJ 2007 Jan 6;334(7583):31.
37. Battersby M, Harvey P, Mills PD, Kalucy E, Pols RG, Frith PA, et al. SA HealthPlus: a controlled trial of a statewide application of a generic model of chronic illness care. Milbank Q. 2007;85(1):37-67.
38. Battersby MW. Health reform through coordinated care: SA HealthPlus. BMJ 2005 Mar 19;330(7492):662-665.
39. Rosser WW, Kasperski J. Organizing primary care for an integrated system. Healthc.Pap. 1999 Winter;1(1):5-21.
40. Krakauer R, Cowling C, Parker K. Health human resources: consider the health technology professions. Healthc.Pap. 2002;3(2):61-6; discussion 76-9.
41. Pogue P. The nurse practitioner role: into the future. Can.J.Nurs.Leadersh. 2007;20(2):34-38.
42. Hutchison B. A long time coming: primary healthcare renewal in canada. Healthc.Pap. 2008;8(2):10-24.
43. Scully H. Building on one of the best delivery systems in the world. Healthc.Pap. 1999 Winter;1(1):23-32; discussion 89-93.
44. Litaker DG, Watts B. From the editors. Qual.Manag.Health Care 2008 Jan-Mar;17(1):1.
45. Watts B, Lawrence R, Litaker D, Aron DC, Neuhauser D. Quality of care by a hypertension expert: a cautionary tale for pay-for-performance approaches. Qual.Manag.Health Care 2008 Jan-Mar;17(1):35-46.
46. Hendrickson MA. Pay for performance and medical professionalism. Qual.Manag.Health Care 2008 Jan-Mar;17(1):9-18.
47. Rose J. Industry influence in the creation of pay-for-performance quality measures. Qual.Manag.Health Care 2008 Jan-Mar;17(1):27-34.
48. Weyer SM, Bobiak S, Stange KC. Possible unintended consequences of a focus on performance: insights over time from the research association of practices network. Qual.Manag.Health Care 2008 Jan-Mar;17(1):47-52.
49. Armour BS, Pitts MM, Maclean R, Cangialose C, Kishel M, Imai H, et al. The effect of explicit financial incentives on physician behavior. Arch.Intern.Med. 2001 May 28;161(10):1261-1266.

50. Wright CJ. Physician remuneration methods: the need for change and flexibility. CMAJ 1996 Mar 1;154(5):678-680.
51. Weingarten SR, Henning JM, Badamgarav E, Knight K, Hasselblad V, Gano A,Jr, et al. Interventions used in disease management programmes for patients with chronic illness-which ones work? Meta-analysis of published reports. BMJ 2002 Oct 26;325(7370):925.
52. Chodosh J, Morton SC, Mojica W, Maglione M, Suttorp MJ, Hilton L, et al. Meta-analysis: chronic disease self-management programs for older adults. Ann.Intern.Med. 2005 Sep 20;143(6):427-438.
53. Richardson G, Gravelle H, Weatherly H, Ritchie G. Cost-effectiveness of interventions to support self-care: a systematic review. Int.J.Technol.Assess.Health Care 2005 Fall;21(4):423-432.
54. Griffiths C, Foster G, Ramsay J, Eldridge S, Taylor S. How effective are expert patient (lay led) education programmes for chronic disease? BMJ 2007 Jun 16;334(7606):1254-1256.
55. Foster G, Taylor SJ, Eldridge SE, Ramsay J, Griffiths CJ. Self-management education programmes by lay leaders for people with chronic conditions. Cochrane Database Syst.Rev. 2007 Oct 17;(4)(4):CD005108.
56. Kennedy A, Reeves D, Bower P, Lee V, Middleton E, Richardson G, et al. The effectiveness and cost effectiveness of a national lay-led self care support programme for patients with long-term conditions: a pragmatic randomised controlled trial. J.Epidemiol.Community Health 2007 Mar;61(3):254-261.
57. Gately C, Rogers A, Sanders C. Re-thinking the relationship between long-term condition self-management education and the utilisation of health services. Soc.Sci.Med. 2007 Sep;65(5):934-945.
58. Eakin EG, Bull SS, Glasgow RE, Mason M. Reaching those most in need: a review of diabetes self-management interventions in disadvantaged populations. Diabetes Metab.Res.Rev. 2002 Jan-Feb;18(1):26-35.
59. Goldman DP, Smith JP. Can patient self-management help explain the SES health gradient? Proc.Natl.Acad.Sci.U.S.A. 2002 Aug 6;99(16):10929-10934.
60. Rothman RL, DeWalt DA, Malone R, Bryant B, Shintani A, Crigler B, et al. Influence of patient literacy on the effectiveness of a primary care-based diabetes disease management program. JAMA 2004 Oct 13;292(14):1711-1716.
61. Nielsen-Bohlman L, Panzer AM, Kindig DA, Institute of Medicine Committee on Health Literacy. Health Literacy: A Prescription to End Confusion. Washington, DC: National Academies Press; 2004.
62. Harvey K. Effects of the Heartbeat Wales programme. Health promotion is a waste of time and money. BMJ 1998 Sep 26;317(7162):887.
63. Keep condom use high, retain no-charge status.(says Louisiana Office of Public Health's Department of Health and Hospitals in New Orleans). Contraceptive Technology Update 1999;20(10):118.
64. Chetkovich C, Mauldon J, Brindis C, Guendelman S. Informed policy making for the prevention of unwanted pregnancy. Understanding low-income women's experiences with family planning. Eval.Rev. 1999 Oct;23(5):527-552.
65. Raphael D. Barriers to addressing the societal determinants of health: public health units and poverty in Ontario, Canada. Health.Promot.Int. 2003 Dec;18(4):397-405.
66. Krause DS. Economic effectiveness of disease management programs: a meta-analysis. Dis Manag 2005;8(2):114-34.
67. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. JAMA 1999 Oct 20;282(15):1458-1465.
68. Grimshaw J, Eccles M, Thomas R, MacLennan G, Ramsay C, Fraser C, et al. Toward evidence-based quality improvement. Evidence (and its limitations) of the effectiveness of guideline dissemination and implementation strategies 1966-1998. J.Gen.Intern.Med. 2006 Feb;21 Suppl 2:S14-20.
69. Garg AX, Adhikari NK, McDonald H, Rosas-Arellano MP, Devereaux PJ, Beyene J, et al. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. JAMA 2005 Mar 9;293(10):1223-1238.
70. Davis DA, Taylor-Vaisey A. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. CMAJ 1997 Aug 15;157(4):408-416.
71. Kawamoto K, Houlihan CA, Balas EA, Lobach DF. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. BMJ 2005 Apr 2;330(7494):765.
72. Rousseau N, McColl E, Newton J, Grimshaw J, Eccles M. Practice based, longitudinal, qualitative interview study of computerised evidence based guidelines in primary care. BMJ 2003;326(7384):314.
73. Johnson K, Bowen S, Zhang L, Kreindler SA. Evaluation of the Manitoba Demonstration Project in Physician Demand-Side Control for Diagnostic Imaging. Winnipeg, MB: WRHA; 2007.

74. Linder JA, Ma J, Bates DW, Middleton B, Stafford RS. Electronic health record use and the quality of ambulatory care in the United States. Arch.Intern.Med. 2007 Jul 9;167(13):1400-1405.
75. Ash JS, Gorman PN, Lavelle M, Payne TH, Massaro TA, Frantz GL, et al. A cross-site qualitative study of physician order entry. J.Am.Med.Inform.Assoc. 2003 Mar-Apr;10(2):188-200.
76. Ash JS, Sittig DF, Poon EG, Guappone K, Campbell E, Dykstra RH. The extent and importance of unintended consequences related to computerized provider order entry. J.Am.Med.Inform.Assoc. 2007 Jul-Aug;14(4):415-423.
77. Browne G, Roberts J, Byrne C, Gafni A, Weir R, Majumdar B. More effective and less expensive community approaches to care of vulnerable populations: Lessons from 12 studies in Ontario. Hamilton, ON: System-Linked Research Unit; 2001 (Report #2001-3). Available at: http://fhs.mcmaster.ca/slru/paper/lessons_12studiesJoNpub.pdf. Accessed March 11, 2008.
78. Watt S, Browne G, Gafni A. Community care for people with chronic conditions: an analysis of nine studies of health and social service utilization in Ontario. Milbank Q. 1999;77(3):363-92, 275.
79. Roberts J, Browne GB, Streiner D, Gafni A, Pallister R, Hoxby H, et al. Problem-solving counselling or phone-call support for outpatients with chronic illness: effective for whom? Canadian Journal of Nursing Research 1995;27(3):111-137.
80. Sarason IG, Sarason BR. Abnormal Psychology: The Problem of Maladaptive Behavior. 11th ed. Upper Saddle River, NJ: Prentice Hall; 2004.
81. Stein LI, Santos AB. Assertive Community Treatment for people with severe mental illness. New York: W.W.Norton & Company; 1998.
82. Turner J. 38 street people costing millions. Winnipeg Free Press, February 2, 2008. Available at: http://www.winnipegfreepress.com/local/story/4118817p-4713847c.html. Accessed April 16, 2008.
83. Villeneuve M, MacDonald J. Toward 2020: Visions for nursing. Ottawa, ON: Canadian Nurses Association; 2006.
84. Leape LL, Rogers G, Hanna D, Griswold P, Federico F, Fenn CA, et al. Developing and implementing new safe practices: voluntary adoption through statewide collaboratives. Qual.Saf.Health.Care. 2006 Aug;15(4):289-295.
85. Johnson K. Evaluation of Phase I of the WRHA MedRec Project. Winnipeg, MB: WRHA; 2007.
86. Weber V, Joshi MS. Effecting and leading change in health care organizations. Jt.Comm.J.Qual.Improv. 2000 Jul;26(7):388-399.
87. Gold SK, Abelson J, Charles CA. From rhetoric to reality: including patient voices in supportive cancer care planning. Health Expect. 2005 Sep;8(3):195-209.
88. Bate P, Glenn R, McLeod H. Report on the 'Breakthrough' Collaborative approach to quality and service improvement within four regions of the NHS. University of Birmingham Health Services Management Centre School of Public Policy; 2002.
89. Ham C, Kipping R, McLeod H, Meredith P. Capacity, culture, and leadership: lessons from experience of improving access to hospital services. Birmingham, UK: Health Services Mangement Centre, School of Public Policy, University of Birmingham; 2002.
90. Canadian Health Services Research Foundation. Myth: An ounce of prevention buys a pound of cure. Ottawa, ON: CHSRF; 2003.
91. Leggat SG, Dwyer J. Improving hospital performance: culture change is not the answer. Healthc.Q. 2005;8(2):60-66.
92. Quinn RE, Kimberley JR. Paradox, Planning, and Perseverance: Guidelines for Managerial Practice. In: Kimberley JR, Quinn RE, editors. Managing Organizational Transitions Homewood, IL: Dow Jones-Irwin; 1984. p. 295-313.
93. Shortell SM, O'Brien JL, Carman JM, Foster RW, Hughes EF, Boerstler H, et al. Assessing the impact of continuous quality improvement/total quality management: concept versus implementation. Health Serv.Res. 1995 Jun;30(2):377-401.
94. Hung DY, Rundall TG, Tallia AF, Cohen DJ, Halpin HA, Crabtree BF. Rethinking prevention in primary care: applying the chronic care model to address health risk behaviors. Milbank Q. 2007;85(1):69-91.
95. Mills PD, Weeks WB. Characteristics of successful quality improvement teams: lessons from five collaborative projects in the VHA. Jt.Comm.J.Qual.Saf. 2004 Mar;30(3):152-162.
96. Balding C. Embedding organisational quality improvement through middle manager ownership. Int.J.Health Care Qual.Assur.Inc.Leadersh.Health Serv. 2005;18(4-5):271-288.
97. NHS Institute for Innovation and Improvement. Sustainability and its relationship with spread and adoption. (Improvement Leaders' Guide 1.7.) London: Department of Health; 2006. Available at:

http://www.institute.nhs.uk/index.php?option=com_content&task=view&id=134&Itemid=351. Accessed May 1, 2008.
98. Ham C. Improving the performance of health services: the role of clinical leadership. Lancet 2003 Jun 7;361(9373):1978-1980.
99. Pare G, Sicotte C, Jacques H. The effects of creating psychological ownership on physicians' acceptance of clinical information systems. J.Am.Med.Inform.Assoc. 2006 Mar-Apr;13(2):197-205.
100. Form reconciles meds, but doctor buy-in difficult. ED Manag. 2006;18(2):3-4.
101. Jackson GL, Yano EM, Edelman D, Krein SL, Ibrahim MA, Carey TS, et al. Veterans Affairs primary care organizational characteristics associated with better diabetes control. Am.J.Manag.Care 2005 Apr;11(4):225-237.
102. Bowen S. Learning from patient experiences: strategies for obtaining patient input (concept paper). Winnipeg Regional Health Authority; 2006.
103. Kreindler S. Patient involvement and the politics of methodology (concept paper). Winnipeg Regional Health Authority; 2007.
104. Blalock AB. Evaluation research and the performance management movement: from estrangement to useful integration? Evaluation 1999;5(2):117-149.
105. MacColl Institute for Healthcare Innovation, Group Health Cooperative. Assessment of Chronic Illness Care (ACIC), Version 3.5. Available at: http://www.improvingchroniccare.org/ACIC%20docs/ACIC_V3.5.doc. Accessed December 15, 2007.
106. Goldratt EM. The goal: A process of ongoing improvement. 3rd revised ed. Great Barrington, MA: North River Press; 2004.
107. Dooris M. Healthy settings: challenges to generating evidence of effectiveness. Health.Promot.Int. 2006 Mar;21(1):55-65.
108. Ottawa Charter for Health Promotion. First International Conference on Health Promotion 1986 Ottawa, 21 November: Available at: http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf, accessed March 11, 2008.
109. Hyndman B, University of Toronto. Centre for Health Promotion, Participaction. Health promotion in action: a review of the effectiveness of health promotion strategies. Toronto, ON: Centre for Health Promotion, University of Toronto; 1998.
110. Ebrahim S, Smith GD. Effects of the Heartbeat Wales programme: effects of government policies on health behaviour must be studied. BMJ 1998 Sep 26;317(7162):886.
111. Lyons R, Langille L. Healthy lifestyle: Strengthening the effectiveness of lifestyle approaches to improve health. 2000.
112. Nilsen P. The theory of community based health and safety programs: a critical examination. Inj.Prev. 2006 Jun;12(3):140-145.
113. Roberts CK, Barnard RJ. Effects of exercise and diet on chronic disease. J.Appl.Physiol. 2005 Jan;98(1):3-30.
114. Campos P, Saguy A, Ernsberger P, Oliver E, Gaesser G. The epidemiology of overweight and obesity: public health crisis or moral panic? Int.J.Epidemiol. 2006 Feb;35(1):55-60.
115. Oliver JE. Fat politics : the real story behind America's obesity epidemic. New York: Oxford University Press; 2006.
116. Telford RD. Low physical activity and obesity: causes of chronic disease or simply predictors? Med.Sci.Sports Exerc. 2007 Aug;39(8):1233-1240.
117. Klein S, Fontana L, Young VL, Coggan AR, Kilo C, Patterson BW, et al. Absence of an effect of liposuction on insulin action and risk factors for coronary heart disease. N.Engl.J.Med. 2004 Jun 17;350(25):2549-2557.
118. Curioni CC, Lourenco PM. Long-term weight loss after diet and exercise: a systematic review. Int.J.Obes.(Lond) 2005 Oct;29(10):1168-1174.
119. Wing RR, Phelan S. Long-term weight loss maintenance. The American Journal of Clinical Nutrition 2005;82(1 Suppl).
120. Pignone MP, Ammerman A, Fernandez L, Orleans CT, Pender N, Woolf S, et al. Counseling to promote a healthy diet in adults: a summary of the evidence for the U.S. Preventive Services Task Force. Am.J.Prev.Med. 2003 Jan;24(1):75-92.
121. Eakin EG, Glasgow RE, Riley KM. Review of primary care-based physical activity intervention studies: effectiveness and implications for practice and future research. J.Fam.Pract. 2000 Feb;49(2):158-168.
122. Morgan O. Approaches to increase physical activity: reviewing the evidence for exercise-referral schemes. Public Health 2005 May;119(5):361-370.
123. Ogilvie D, Foster CE, Rothnie H, Cavill N, Hamilton V, Fitzsimons CF, et al. Interventions to promote walking: systematic review. BMJ 2007 Jun 9;334(7605):1204.

124. Stead LF, Lancaster T. Group behaviour therapy programmes for smoking cessation. Cochrane Database Syst.Rev. 2005 Apr 18;(2)(2):CD001007.
125. French SA, Story M, Jeffery RW. Environmental influences on eating and physical activity. Annu.Rev.Public Health 2001;22:309-335.
126. Jeffery RW. Public health strategies for obesity treatment and prevention. Am.J.Health Behav. 2001 May-Jun;25(3):252-259.
127. Nestle M, Jacobson MF. Halting the obesity epidemic: a public health policy approach. Public Health Rep. 2000 Jan-Feb;115(1):12-24.
128. Heart and Stroke Foundation. Annual report card on Canadians' health. Toronto, ON: HSF; 2000.
129. Canadian Labour Congress. Creating more and better jobs through reduction and redistribution of work time. Ottawa: CLC; 1998. Available at: http://canadianlabour.ca/updir/create.pdf. Accessed March 11, 2008.
130. Heisz A, LaRochelle-Côté S. Summary of: Work hours instability in Canada. Ottawa: Statistics Canada, 2008. Available at: http://www.statcan.ca.proxy1.lib.umanitoba.ca/english/research/11F0019MIE/11F0019MIE2006279.pdf. Accessed March 11, 2008.
131. Marcus BH, Owen N, Forsyth LH, Cavill NA, Fridinger F. Physical activity interventions using mass media, print media, and information technology. Am.J.Prev.Med. 1998 Nov;15(4):362-378.
132. Orwell G. The road to Wigan Pier. London: Victor Gollancz; 1937.
133. Chin NP, Monroe A, Fiscella K. Social determinants of (un) healthy behaviors. Education for Health 2000;13(3):317-328.
134. Raphael D. Inequality is Bad for Our Hearts: Why Low Income and Social Exclusion are Major Causes of Heart Disease in Canada. Toronto, ON: North York Heart Health Network; 2001. Available at: http://www.precaution.org/lib/inequality_bad_for_our_hearts.2001.pdf. Accessed March 11, 2008.
135. Ricciuto L, Tarasuk V, Yatchew A. Socio-demographic influences on food purchasing among Canadian households. Eur.J.Clin.Nutr. 2006 Jun;60(6):778-790.
136. Gordon R, McDermott L, Stead M, Angus K. The effectiveness of social marketing interventions for health improvement: what's the evidence? Public Health 2006 Dec;120(12):1133-1139.
137. Sutherland M, Sylvester AK. Advertising and the mind of the consumer: What works, what doesn't, and why (2nd ed.). St Leonards, Australia: Allen & Unwin; 2000.
138. Aronson E. The Social Animal. 6th ed. New York: Freeman & Co.; 1992.
139. Tudor-Smith C, Nutbeam D, Moore L, Catford J. Effects of the Heartbeat Wales programme over five years on behavioural risks for cardiovascular disease: quasi-experimental comparison of results from Wales and a matched reference area. BMJ 1998 Mar 14;316(7134):818-822.
140. Howell EM, Devaney B, McCormick M, Raykovich KT. Back to the future: community involvement in the Healthy Start Program. J.Health Polit.Policy Law 1998 Apr;23(2):291-317.
141. Boutilier M. The effectiveness of community action in health promotion: a research perspective. Toronto, ON: Centre for Health Promotion; 1996.
142. O'Loughlin JL, Paradis G, Gray-Donald K, Renaud L. The impact of a community-based heart disease prevention program in a low-income, inner-city neighborhood. Am J Public Health 1999;89:1819-26.
143. Ross DP. Policy approaches to address the impact of poverty on health: A scan of the poverty literature. Ottawa: CIHI; 2002. Available at: http://www.cihi.ca/cihiweb/dispPage.jsp?cw_page=GR_323_E. Accessed March 12, 2002.
144. Lindsey E, Stajduhar K, McGuinness L. Examining the process of community development. J.Adv.Nurs. 2001 Mar;33(6):828-835.
145. Raeburn J, Corbett T. Community development: How effective is it as an approach in health promotion? Paper presented at the Second International Symposium on the Effectiveness of Health Promotion 2001, May 28-30; Auckland, NZ. Available at: http://www.utoronto.ca/chp/download/2ndSymposium/J.%20Raeburn.doc. Accessed April 28, 2008.
146. Winnipeg Regional Health Authority. Community development framework. Winnipeg: WRHA; 2007. Available at: http://www.wrha.mb.ca/community/commdev/files/CommDev_Framework_07.pdf. Accessed May 6, 2008.
147. Minkler M. Community organization among the elderly poor in the United States: a case study. Int J Health Svcs 1992; 22(2):303-316.
148. Minkler M, Wallerstein N editors. Community-based participatory research for health. San Francisco: Jossey-Bass; 2003.
149. Roussos ST, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. Annu.Rev.Public Health 2000;21:369-402.

150. Devaney B, Howell E, McCormik M, Moreno L. Reducing infant mortality: Lessons learned from Healthy Start. 2000. Available at: http://www.mathematica-mpr.com/PDFs/healthyfinal.pdf. Accessed March 11, 2008.
151. Krieger J, Allen C, Cheadle A, Ciske S, Schier JK, Senturia K, et al. Using community-based participatory research to address social determinants of health: lessons learned from Seattle Partners for Healthy Communities. Health Educ.Behav. 2002 Jun;29(3):361-382.
152. Prevention Research Centers, Centers for Disease Control and Prevention. A collective voice for well-being: The story of the National Community Committee. Atlanta, GA: US Department of Health and Human Services; 2008. Available at: http://www.cdc.gov.proxy2.lib.umanitoba.ca.proxy1.lib.umanitoba.ca/PRC/pdf/prc_collectivevoice.pdf. Accessed March 27, 2008.
153. Engbers LH, van Poppel MN, Chin A Paw MJ, van Mechelen W. Worksite health promotion programs with environmental changes: a systematic review. Am.J.Prev.Med. 2005 Jul;29(1):61-70.
154. Wilson MG, Holman PB, Hammock A. A comprehensive review of the effects of worksite health promotion on health-related outcomes. Am.J.Health Promot. 1996 Jul-Aug;10(6):429-435.
155. James J, Kerr D. Prevention of childhood obesity by reducing soft drinks. Int.J.Obes.(Lond) 2005 Sep;29 Suppl 2:S54-7.
156. Marcus BH, Williams DM, Dubbert PM, Sallis JF, King AC, Yancey AK, et al. Physical activity intervention studies: what we know and what we need to know: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity); Council on Cardiovascular Disease in the Young; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research. Circulation 2006 Dec 12;114(24):2739-2752.
157. Delva J, O'Malley PM, Johnston LD. Availability of more-healthy and less-healthy food choices in American schools: a national study of grade, racial/ethnic, and socioeconomic differences. Am.J.Prev.Med. 2007 Oct;33(4 Suppl):S226-39.
158. Johnston LD, Delva J, O'Malley PM. Soft drink availability, contracts, and revenues in American secondary schools. Am.J.Prev.Med. 2007 Oct;33(4 Suppl):S209-25.
159. Rideout K, Levy-Milne R, Martin C, Ostry AS. Food sales outlets, food availability, and the extent of nutrition policy implementation in schools in British Columbia. Can.J.Public Health 2007 Jul-Aug;98(4):246-250.
160. Fox S, Meinen A, Pesik M, Landis M, Remington PL. Competitive food initiatives in schools and overweight in children: a review of the evidence. WMJ 2005 Jul;104(5):38-43.
161. Cullen KW, Watson K, Zakeri I, Ralston K. Exploring changes in middle-school student lunch consumption after local school food service policy modifications. Public Health Nutr. 2006 Sep;9(6):814-820.
162. French SA. Public health strategies for dietary change: schools and workplaces. J.Nutr. 2005 Apr;135(4):910-912.
163. Kim D, Kawachi I. Food taxation and pricing strategies to "thin out" the obesity epidemic. Am.J.Prev.Med. 2006 May;30(5):430-437.
164. Heart and Stroke Foundation. Annual report card on Canadians' health. Toronto, ON: HSF; 2006.
165. Health Canada. Trans Fat. Available at: http://www.hc-sc.gc.ca/fn-an/nutrition/gras-trans-fats/index_e.html. Accessed March 7, 2008.
166. Sallis JF, McKenzie TL, Conway TL, Elder JP, Prochaska JJ, Brown M, et al. Environmental interventions for eating and physical activity: a randomized controlled trial in middle schools. Am.J.Prev.Med. 2003 Apr;24(3):209-217.
167. Evans R. Fat zombies, Pleistocene tastes, autophilia, and the "obesity epidemic". Healthcare Policy 2006;2(2): 18-26.
168. Papas MA, Alberg AJ, Ewing R, Helzlsouer KJ, Gary TL, Klassen AC. The built environment and obesity. Epidemiol.Rev. 2007;29:129-143.
169. Frank LD, Saelens BE, Powell KE, Chapman JE. Stepping towards causation: do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? Soc.Sci.Med. 2007 Nov;65(9):1898-1914.
170. Sallis JF, Bauman A, Pratt M. Environmental and policy interventions to promote physical activity. Am.J.Prev.Med. 1998 Nov;15(4):379-397.
171. Ball K, Timperio AF, Crawford DA. Understanding environmental influences on nutrition and physical activity behaviors: where should we look and what should we count? Int.J.Behav.Nutr.Phys.Act. 2006 Sep 26;3:33.
172. Halpern DF. How time-flexible work policies can reduce stress, improve health, and save money. Stress and Health 2005;21:157-168.
173. Patrick K, Lavery JF. Burnout in nursing. Aust.J.Adv.Nurs. 2007 Mar-May;24(3):43-48.

174. Leitner K, Resch MG. Do the effects of job stressors on health persist over time? A longitudinal study with observational stressor measures. J.Occup.Health Psychol. 2005 Jan;10(1):18-30.
175. Thompson F. Where do we go from here? The next wave of Canadian tobacco control. Ottawa: Smoking and Health Action Foundation; 2006. Available at: http://www.nsra-adnf.ca/cms/index.cfm?group_id=1468. Accessed March 11, 2008.
176. Lancaster T, Stead LF. Individual behavioural counselling for smoking cessation. Cochrane Database Syst.Rev. 2005 Apr 18;(2)(2):CD001292.
177. Lumley J, Oliver SS, Chamberlain C, Oakley L. Interventions for promoting smoking cessation during pregnancy. Cochrane Database Syst.Rev. 2004 Oct 18;(4)(4):CD001055.
178. Rigotti NA, Munafo MR, Stead LF. Interventions for smoking cessation in hospitalised patients. Cochrane Database Syst.Rev. 2007 Jul 18;(3)(3):CD001837.
179. Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation. Cochrane Database Syst.Rev. 2004;(3)(3):CD000146.
180. Lancaster T, Stead L. Physician advice for smoking cessation. Cochrane Database Syst.Rev. 2004 Oct 18;(4)(4):CD000165.
181. Lando HA. Reflections on 30+ years of smoking cessation research: from the individual to the world. Drug Alcohol Rev. 2006 Jan;25(1):5-14.
182. Jha P, Chaloupka FJ, Corrao M, Jacob B. Reducing the burden of smoking world-wide: effectiveness of interventions and their coverage. Drug Alcohol Rev. 2006 Nov;25(6):597-609.
183. Hammond D, Fong GT, McNeill A, Borland R, Cummings KM. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey. Tob.Control 2006 Jun;15 Suppl 3:iii19-25.
184. Siahpush M, McNeill A, Hammond D, Fong GT. Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: results from the 2002 International Tobacco Control (ITC) Four Country Survey. Tob.Control 2006 Jun;15 Suppl 3:iii65-70.
185. Hammond D, Fong GT, Zanna MP, Thrasher JF, Borland R. Tobacco denormalization and industry beliefs among smokers from four countries. Am.J.Prev.Med. 2006 Sep;31(3):225-232.
186. Farrelly MC, Davis KC, Duke J, Messeri P. Sustaining 'Truth': changes in youth tobacco attitudes and smoking intentions after 3 years of a national antismoking campaign. Health Educ.Res. 2008 Jan 17.
187. Farrelly MC, Healton CG, Davis KC, Messeri P, Hersey JC, Haviland ML. Getting to the truth: evaluating national tobacco countermarketing campaigns. Am.J.Public Health 2002 Jun;92(6):901-907.
188. Secker-Walker RH, Gnich W, Platt S, Lancaster T. Community interventions for reducing smoking among adults. Cochrane Database Syst.Rev. 2002;(3)(3):CD001745.
189. Hey K, Perera R. Quit and Win contests for smoking cessation. Cochrane Database Syst.Rev. 2005 Apr 18;(2)(2):CD004986.
190. Sowden A, Arblaster L, Stead L. Community interventions for preventing smoking in young people. Cochrane Database Syst.Rev. 2003;(1)(1):CD001291.
191. Thomas RE, Baker P, Lorenzetti D. Family-based programmes for preventing smoking by children and adolescents. Cochrane Database Syst.Rev. 2007 Jan 24;(1)(1):CD004493.
192. Moher M, Hey K, Lancaster T. Workplace interventions for smoking cessation. Cochrane Database Syst.Rev. 2005 Apr 18;(2)(2):CD003440.
193. Hey K, Perera R. Competitions and incentives for smoking cessation. Cochrane Database Syst.Rev. 2005 Apr 18;(2)(2):CD004307.
194. Thomas R, Perera R. School-based programmes for preventing smoking. Cochrane Database Syst.Rev. 2006 Jul 19;3:CD001293.
195. Davis RM, Wakefield M, Amos A, Gupta PC. The Hitchhiker's Guide to Tobacco Control: a global assessment of harms, remedies, and controversies. Annu.Rev.Public Health 2007;28:171-194.
196. Stewart-Knox BJ, Sittlington J, Rugkasa J, Harrisson S, Treacy M, Abaunza PS. Smoking and peer groups: results from a longitudinal qualitative study of young people in Northern Ireland. Br.J.Soc.Psychol. 2005 Sep;44(Pt 3):397-414.
197. D'Emidio-Caston M, Brown JH. The other side of the story. Student narratives on the California Drug, Alcohol, and Tobacco Education Programs. Eval.Rev. 1998 Feb;22(1):95-117.
198. Mandel LL, Bialous SA, Glantz SA. Avoiding "truth": tobacco industry promotion of life skills training. J.Adolesc.Health 2006 Dec;39(6):868-879.
199. Zhang B, Cohen J, Ferrence R, Rehm J. The impact of tobacco tax cuts on smoking initiation among Canadian young adults. Am.J.Prev.Med. 2006 Jun;30(6):474-479.

200. Remler DK. Poor smokers, poor quitters, and cigarette tax regressivity. Am.J.Public Health 2004 Feb;94(2):225-229.
201. Fox BJ. Framing tobacco control efforts within an ethical context. Tob.Control 2005 Aug;14 Suppl 2:ii38-44.
202. Serra C, Cabezas C, Bonfill X, Pladevall-Vila M. Interventions for preventing tobacco smoking in public places. Cochrane Database Syst.Rev. 2000;(3)(3):CD001294.
203. Borland R, Yong HH, Cummings KM, Hyland A, Anderson S, Fong GT. Determinants and consequences of smoke-free homes: findings from the International Tobacco Control (ITC) Four Country Survey. Tob.Control 2006 Jun;15 Suppl 3:iii42-50.
204. Stead LF, Lancaster T. Interventions for preventing tobacco sales to minors. Cochrane Database Syst.Rev. 2005 Jan 25;(1)(1):CD001497.
205. Etter JF. Laws prohibiting the sale of tobacco to minors: impact and adverse consequences. Am.J.Prev.Med. 2006 Jul;31(1):47-51.
206. Weiss RI, Smith JA. Legislative approaches to the obesity epidemic. J.Public Health Policy 2004;25(3-4):379-390.
207. White J, Bero LA. Public health under attack: the American Stop Smoking Intervention Study (ASSIST) and the tobacco industry. Am.J.Public Health 2004 Feb;94(2):240-250.
208. Siahpush M, McNeill A, Borland R, Fong GT. Socioeconomic variations in nicotine dependence, self-efficacy, and intention to quit across four countries: findings from the International Tobacco Control (ITC) Four Country Survey. Tob.Control 2006 Jun;15 Suppl 3:iii71-5.
209. Wilkins R, Berthelot JM, Ng E. Trends in mortality by neighbourhood income in urban Canada from 1971 to 1996. (Supplement to Health Reports 2002, vol. 13). Ottawa: Statistics Canada; 2002. Available at: http://www.statcan.ca/bsolc/english/bsolc?catno=82-003-SPE20020016353. Accessed May 1, 2008.
210. Krieger J, Higgins DL. Housing and health: time again for public health action. Am.J.Public Health 2002 May;92(5):758-768.
211. Krieger N. Why epidemiologists cannot afford to ignore poverty. Epidemiology 2007 Nov;18(6):658-663.
212. Graham H. Unequal Lives: Health and socioeconomic inequalities Berkshire, England: McGraw-Hill, Open University Press; 2007 (p. 3-18).
213. Raphael D. Social determinants of health: Present status, unanswered questions, and future directions. Int J Health Services 2006;36(4):651-77.
214. Dunn JR. Are widening income inequalities making Canada less healthy? Toronto: Health Determinants Partnership; 2002. Available at: http://www.opc.on.ca/english/our_programs/hprc/HDP-proj-full.pdf. Accessed March 11, 2008.
215. Phipps S. The impact of poverty on health: A scan of recent literature. Ottawa: CIHI; 2002. Available at: http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=GR_323_E. Accessed March 11, 2008.
216. Mullahy J, Robert S, Wolfe B. Health, income, and inequality: Review and redirection for the Wisconsin Russell Sage Working Group. New York: Sage Foundation; 2004. Available at: http://www.russellsage.org/programs/main/inequality/050516.679320/view?searchterm=Health,%20Income,%20and%20Inequality. Accessed March 11, 2008.
217. Canadian Institute for Health Information. Improving the health of Canadians: An introduction to health in urban places. Ottawa: CIHI; 2006. Available at: http://secure.cihi.ca/cihiweb/products/PH_Full_Report_English.pdf. Accessed March 11, 2008.
218. Lemstra M, Neudorf C, Opondo J. Health disparity by neighbourhood income. Can.J.Public Health 2006 Nov-Dec;97(6):435-439.
219. Mustard C, Barer M, Evans RG, Horne J, Mayer T, Derksen S. Paying Taxes and Using Health Care Services: The Distributional Consequences of Tax Financed Universal Health Insurance in a Canadian Province. Ottawa: CSLS Conference on the State of Living Standards and the Quality of Life in Canada; 1998.
220. Benzeval M, Judge K. Income and health: the time dimension. Soc.Sci.Med. 2001 May;52(9):1371-1390.
221. Krantz DS, McCeney MK. Effects of psychological and social factors on organic disease: a critical assessment of research on coronary heart disease. Annu.Rev.Psychol. 2002;53:341-369.
222. Janssen I, Boyce WF, Simpson K, Pickett W. Influence of individual- and area-level measures of socioeconomic status on obesity, unhealthy eating, and physical inactivity in Canadian adolescents. Am.J.Clin.Nutr. 2006 Jan;83(1):139-145.
223. Kirkpatrick S, Tarasuk V. The relationship between low income and household food expenditure patterns in Canada. Public Health Nutr. 2003 Sep;6(6):589-597.
224. Ricciuto LE, Tarasuk VS. An examination of income-related disparities in the nutritional quality of food selections among Canadian households from 1986-2001. Soc.Sci.Med. 2007 Jan;64(1):186-198.

225. Monsivais P, Drewnowski A. The rising cost of low-energy-density foods. J.Am.Diet.Assoc. 2007 Dec;107(12):2071-2076.
226. Kaper J, Wagena EJ, Severens JL, Van Schayck CP. Healthcare financing systems for increasing the use of tobacco dependence treatment. Cochrane Database Syst.Rev. 2005 Jan 25;(1)(1):CD004305.
227. Bancroft A, Wiltshire S, Parry O, Amos A. "It's like an addiction first thing...afterwards it's like a habit": daily smoking behaviour among people living in areas of deprivation. Soc.Sci.Med. 2003 Mar;56(6):1261-1267.
228. Devine CM, Jastran M, Jabs J, Wethington E, Farell TJ, Bisogni CA. "A lot of sacrifices:" work-family spillover and the food choice coping strategies of low-wage employed parents. Soc.Sci.Med. 2006 Nov;63(10):2591-2603.
229. Kaufman L, Karpati A. Understanding the sociocultural roots of childhood obesity: food practices among Latino families of Bushwick, Brooklyn. Soc.Sci.Med. 2007 Jun;64(11):2177-2188.
230. Anderson JV, Bybee DI, Brown RM, McLean DF, Garcia EM, Breer ML, et al. 5 a Day fruit and vegetable intervention improves consumption in a low income population. J.Am.Diet.Assoc. 2001 Feb;101(2):195-202.
231. Moloughney B. Housing and population health: The state of current research knowledge. Ottawa: CIHI; 2004. Available at: http://secure.cihi.ca/cihiweb/products/HousingPopHealth_e.pdf. Accessed March 11, 2008.
232. Katz L, Kling J, Liebman J. The early impacts of moving to opportunity in Boston: Final report to the U.S. Department of Housing and Urban Development. Washington, DC: Us Dept of Housing and Urban Development; 2000. Available at: http://www.hks.harvard.edu/jeffreyliebman/mto_boston_hudreport.pdf. Accessed March 11, 2008.
233. Martens, P. (2002). The health and health care use of Registered First Nations people living in Manitoba: A population-based study). Available at: http://www.umanitoba.ca/centres/mchp/reports-01-01.htm. Accessed May 11, 2007.
234. Frohlich KL, Ross N, Richmond C. Health disparities in Canada today: some evidence and a theoretical framework. Health Policy 2006 Dec;79(2-3):132-143.
235. Reading J. The tobacco report: First Nations and Inuit Regional Health Surveys. Winnipeg: Northern Research Unit, University of Manitoba; 1999.
236. Tremblay MS, Perez CE, Ardern CI, Bryan SN, Katzmarzyk PT. Obesity, overweight and ethnicity. Health Rep. 2005 Jun;16(4):23-34.
237. Lofters A, Glazier RH, Agha MM, Creatore MI, Moineddin R. Inadequacy of cervical cancer screening among urban recent immigrants: a population-based study of physician and laboratory claims in Toronto, Canada. Prev.Med. 2007 Jun;44(6):536-542.
238. McDonald JT, Kennedy S. Cervical cancer screening by immigrant and minority women in Canada. J.Immigr Minor.Health. 2007 Oct;9(4):323-334.
239. Hoffman-Goetz L, Friedman DB. Disparities in the coverage of cancer information in ethnic minority and mainstream mass print media. Ethn.Dis 2005;15(2):332-340.
240. Bowen S. Access to health services for underserved populations in Canada. Report prepared for Health Systems Division, Health Policy and Communications Branch, Health Canada. Ottawa: Health Canada; 2000. Available at: http://www.hc-sc.gc.ca/hcs-sss/pubs/acces/2001-certain-equit-acces/part1-tc-tm_e.html. Accessed May 11, 2007.
241. Campbell M, Bassil K, Morgan C, Lalani M, Macfarlane R, Bienefeld M. Air pollution burden of illness from traffic in Toronto – Problems and solutions. Toronto, ON: Toronto Public Health; 2007. Available at: http://www.toronto.ca/health/hphe/pdf/air_pollution_burden.pdf. Accesed March 11, 2008.
242. Repetto R, Baliga S. Pesticides and the immune system: The public health risks. Washington, DC: World Resources Institute; 1996. Available at: http://pdf.wri.org/pesticidesandimmunesystem_bw.pdf. Accessed March 11, 2008.
243. Jones OA, Maguire ML, Griffin JL. Environmental pollution and diabetes: a neglected association. Lancet 2008 Jan 26;371(9609):287-288.
244. Ha MH, Lee DH, Jacobs DR. Association between serum concentrations of persistent organic pollutants and self-reported cardiovascular disease prevalence: results from the National Health and Nutrition Examination Survey, 1999-2002. Environ.Health Perspect. 2007 Aug;115(8):1204-1209.
245. Lee DH, Lee IK, Jin SH, Steffes M, Jacobs DR,Jr. Association between serum concentrations of persistent organic pollutants and insulin resistance among nondiabetic adults: results from the National Health and Nutrition Examination Survey 1999-2002. Diabetes Care 2007 Mar;30(3):622-628.
246. Lee DH, Lee IK, Porta M, Steffes M, Jacobs DR,Jr. Relationship between serum concentrations of persistent organic pollutants and the prevalence of metabolic syndrome among non-diabetic adults: results from the National Health and Nutrition Examination Survey 1999-2002. Diabetologia 2007 Sep;50(9):1841-1851.

247. Lee DH, Lee IK, Song K, Steffes M, Toscano W, Baker BA, et al. A strong dose-response relation between serum concentrations of persistent organic pollutants and diabetes: results from the National Health and Examination Survey 1999-2002. Diabetes Care 2006 Jul;29(7):1638-1644.
248. Cooper GS, Miller FW, Germolec DR. Occupational exposures and autoimmune diseases. Int.Immunopharmacol. 2002 Feb;2(2-3):303-313.
249. Williamson DM. Studies of multiple sclerosis in communities concerned about environmental exposures. J.Womens Health.(Larchmt) 2006 Sep;15(7):810-814.
250. Science and Environmental Health Networks. The Precautionary Principle. 1998; Available at: http://www.sehn.org/precaution.html. Accessed March 12, 2008.
251. Thomas P, McDonnell J, McCulloch J, While A, Bosanquet N, Ferlie E. Increasing capacity for innovation in bureaucratic primary care organizations: a whole system participatory action research project. Ann.Fam.Med. 2005 Jul-Aug;3(4):312-317.
252. Hoffman C, Bead P, Greenall J, U D, White J. Canadian root cause analysis framework. Edmonton, AB: Canadian Patient Safety Institute; 2006.